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INTEGRATED BATTLEFIELD EFFECTS RESEARCH FOR THE NATIONAL TRAINING CENTER

Appendix J—Division/Corps Training Simulation System

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

Research performed to evaluate and develop enhancements for integrated battlefield training at the U.S. Army National Training Center is described. These enhancements had been identified and concepts developed for their application in earlier phases of this research. The report consists of the basic volume summarizing the research tasks, approach, results, conclusions, and recommendations; plus twelve appendices which provide details on the nine major tasks into which the research was divided. Research performed and the associated appendices are as follows:

Development of nuclear and chemical environmental and effects software:
- Analysis of nuclear algorithms — Appendix A
- Requirements specification for nuclear and chemical model algorithms at the NTC — Appendix B
- Chemical model algorithm description — Appendix C

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Demonstration of the system for combining live and notional battalions for training higher level staffs in integrated battlefield (IB) command and control:

Functional requirements analysis for IB command and control simulation	Appendix D
Report on the demonstration	Appendix E

Analysis and design of field simulators for nuclear and chemical warfare:

Technical and operational impacts of field simulators	Appendix F
Capability of off-the-shelf paging system to communicate at Ft. Irwin	Appendix G
Designs of field simulators	Appendix H

Adaptation of nuclear and chemical software to other Army training models:

Feasibility of transferring ARTBASS Code from Perkin-Elmer to VAX	Appendix I
Division/Corps training simulation functional analysis	Appendix J
ARTBASS conversion to VAX	Appendix K
Requirements specification for adding nuclear and chemical models to ARTBASS	Appendix L

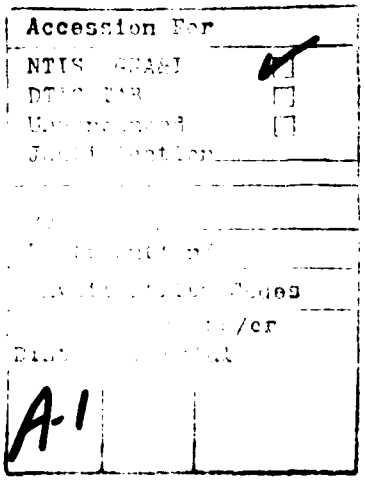
This research provided the following products:

Software which models nuclear and chemical environment and effects with appropriate fidelity and timing for training and which is ready for installation on NTC computers.

A demonstrated capability for combining actions of real battalions with computer simulated notional battalions for training brigade/division commanders and staffs.

An analysis of the impacts of using field simulators at the NTC for nuclear and chemical warfare training, and the designs of the selected simulators (i.e., common control system, radiacmeters, dosimeters, chemical detectors).

Analysis of the application of nuclear and chemical models to other Army battalion training models; conversion of the ARTBASS model to operate on the VAX 11/780; incorporation of the nuclear and chemical models into ARTBASS; and demonstration of the nuclear and chemical models using ARTBASS.



CONVERSION FACTORS FOR U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

To Convert From	To	Multiply By
angstrom	meters (m)	1.000 000 X E -10
atmosphere (normal)	kilo pascal (kPa)	1.013 25 X E +2
bar	kilo pascal (kPa)	1.000 000 X E +2
barn	meter^2 (m^2)	1.000 000 X E -28
British thermal unit (thermochemical)	joule (J)	1.054 350 X E +3
cal (thermochemical)/cm^2	mega joule/m^2 (MJ/m^2)	4.184 000 X E -2
calorie (thermochemical)	joule (J)	4.184 000
calorie (thermochemical)/g	joule per kilogram (J/kg)*	4.184 000 X E +3
curie	giga becquerel (Gbq) **	3.700 000 X E +1
degree Celsius	degree kelvin (K)	$t_K = t°_C + 273.15$
degree (angle)	radian (rad)	1.745 329 X E -2
degree Farenheit	degree kelvin (K)	$t_K = (t°_F + 459.67)$ 1.8
electron volt	joule (J)	1.602 19 X E -19
erg	joule (J)	1.000 000 X E -7
erg/second	watt (W)	1.000 000 X E -7
foot	meter (m)	3.048 000 X E -1
foot-pound-force	joule (J)	1.355 818
gallon (U.S. liquid)	meter^3 (m^3)	3.785 412 X E -3
inch	meter (m)	2.540 000 X E -2
jerk	joule (J)	1.000 000 X E +9
joule kilogram (J/kg) (radiation dose absorbed)	gray (Gy)*	1.000 000
kilotons	terajoules	4.183
kip (1000 lbf)	newton (N)	4.448 222 X E +3
kip/inch^2 (ksi)	kilo pascal (kPa)	6.894 757 X E +3
ktap	newton-second/m^2 (N-s/m^2)	1.000 000 X E +2
micron	meter (m)	1.000 000 X E -6
mil	meter (m)	2.540 000 X E -5
mile (international)	meter (m)	1.609 344 X E +3
ounce	kilogram (kg)	2.834 952 X E -2
pound-force (lbf avoirdupois)	newton (N)	4.448 222
pound-force inch	newton-meter (N-m)	1.129 848 X E -1
pound-force/inch	newton/meter (N/m)	1.751 268 X E +2
pound-force/foot^2	kilo pascal (kPa)	4.788 026 X E -2
pound-force/inch^2 (psi)	kilo pascal (kPa)	6.894 757
pound-mass (lbm avoirdupois)	kilogram (kg)	4.535 924 X E -1
pound-mass-foot^2 (moment of inertia)	kilogram-meter^2 (kg-m^2)	4.214 011 X E -2
pound-mass/foot^3	kilogram-meter^3 (kg/m^3)	1.601 846 X E +1
rad (radiation dose absorbed	gray (Gy)*	1.000 000 X E -2
roentgen	coulomb/kilogram (C/kg)	2.579 760 X E -4
shake	second (s)	1.000 000 X E -8
slug	kilogram (kg)	1.459 390 X E +1
torr (mm Hg, 0° C)	kilo pascal (kPa)	1.333 22 X E -1

*The gray (Gy) is the accepted SI unit equivalent to the energy imparted by ionizing radiation to a mass and corresponds to one joule kilogram.

**The becquerel (Bq) is the SI unit of radioactivity; 1 Bq = 1 event s.

EXECUTIVE SUMMARY

This research was performed to assist the Operations and Training Simulation Division (OTSD) of the Combined Arms Operations Research Activity (CAORA) in establishing the best technical approach for development of a command and control training system for division and corps command groups. As such, this research represents only one portion of the total effort and should be viewed in that manner.

A simulation-driven training system is required to provide training in command and control of combat operations for the division and corps command groups and thereby increase the combat readiness of these command groups. The training system must provide more effective training than the current command post exercises (CPX) and must be more cost effective than the field training exercise (FTX). Training effectiveness can be improved by presenting to the training audience (commander and selected staff elements) a realistic representation of the combat operational environment, by requiring the training audience to perform normal staff decision making processes, and by providing feedback to the trainees to suggest ways to improve and/or speed the staff processes thus allowing for more timely and possibly better, more informed decisions.

The training system concept envisions the staff (officers, NCO's, and enlisted) and commander (division or corps) operating in a reasonable facsimile of the combat environment, either in full TOE facilities or in a mock-up of those facilities, and using the tools and equipment which they expect to be available in combat. Other units and organizations with which the staff conducts business would be represented by controller personnel who will interact with the combat simulation to provide information and data to the trainees and to input (to the simulation) data reflecting the decisions and orders coming from the training audience. The combat simulation must fully support this interaction by providing easily useable data to the controllers, with simplified formats and prompts for input data. The simulation must be free play and must respond in a realistic manner to the input orders and data. It must represent fully the battlefield functions (combat, combat support, and combat service support) of concern to the training audience to allow full and complete exercise of all staff and command functions. The simulation must represent the timing of all functions and events in a realistic manner. In order to provide maximum training benefit the simulation must be capable of stop, restart, and replay of selected segments. The capability to store and retrieve data relating to specific actions, activities, and the on-going battlefield situation is also required to provide

feedback to the training audience thus facilitating the learning experience.

The training system should be adaptable for use by either division or corps. Corps level training should support the concurrent training of one or more division staffs or the representation of those staffs by controller personnel. The system must also support the training of individual staff elements at either echelon through representation of other staff functions by controller personnel and by the simulation.

Definition of the required simulation-controller interaction and the controller-trainee interactions requires a complete information flow analysis. An initial analysis has been made in this project. Several previous studies in this area were examined and combined to form a consolidated list of information items required by the staff and commander of division or corps organizations. The information items define broad areas of information which consist of multiple data elements. The resulting compilation consists of 57 information items which contain a total of 284 data elements. The information flow analysis was limited to only the information items due to time constraints on this project. Further analysis of the channels and frequency of data element flow will be required prior to final system/simulation design specification.

The exchange of information items between staff elements within each command post and between staff elements and external agencies was examined and defined using the technique of N^2 (N square) charting. This analysis provided a preliminary definition of controller station requirements and is included in the report for use in defining the information requirements which the simulation must satisfy for controllers.

The Army desires to field an interim training system to partially fill the requirement within two years. Fulfillment of the total requirement is anticipated to take approximately six years of development effort.

Table 1 provides a summary of the training system requirements and identifies those that are considered essential for the short-term capability, those that must be at least partially met in the short-term, and those that can be deferred to the long-term development.

Table 1. Summary of division/corps training simulation requirements.

DIVISION/CORPS TRAINING SIMULATION REQUIREMENTS	NEED FOR SHORT TERM CAPABILITY		
	ESSENTIAL	PARTIAL	DEFERRED
1. Support command group training in a realistic operational environment.			
a. Train division and corps command groups concurrently as well as independently		X	
b. Train command group as an integrated force management team	X		
c. Train general staff sections independently in their functional roles			X
d. Use organic systems, equipment, and procedures support training	X		
e. Support training under simulated combat conditions	X		
2. Support command group training through a systematized approach.			
a. Represent all battle field functions and conditions		X	
b. Support role playing of command groups/ units external to the training audience	X		
c. Permit two-sided free play of simulated combat, combat support, and combat service support operations	X		
d. Provide flexibility and continuity of training by a capability to interrupt, freeze, and restart training as well as to replay the training scenario	X		
e. Provide rapid feedback to the training audience	X		

The short-term capability can be developed only by using some existing combat simulation as a development base. In this effort, seven existing simulations were examined with this purpose in mind. The simulations are:

- ARTBASS - Army Training Battle Simulation System

  ARTBASS is a computer-based, free-play, interactive, two-sided engagement training simulation that is used to provide training for battalion comand groups (commanders and their staffs) by realistically simulating ground combat operations between friendly and enemy forces. The command and control at battalion level is represented live by the battalion command group while higher, lower, adjacent, and supporting organizations are played by role playing controllers who interface between the command group and the mathematical model/computer system which simulates combat, combat support, and combat service support operations.

- FOURCE - Command, Control, Communications, and Combat Effectiveness

  The FOURCE Model is a deterministic, division level, force-on-force, mathematical combat model which executes without player intervention. Force units are resolved at battalion level. The command, control, and communications processes are represented in great detail to allow examination of the contribution to force effectiveness of various command and control and intelligence system alternatives. Emphasis is given to the simulation of various aspects of staff performance and combat information/intelligence flow in order to measure the contribution of alternative command and control (C2) and intelligence systems to the combat effectiveness of the force.

- JANUS

The JANUS Model (not an acronym but named for the two-faced Roman god) is a computerized, interactive ground combat simulation model utilizing dynamic graphics representation for game play. The model permits detailed treatment of nuclear, chemical, and conventional military systems and digitized terrain. JANUS is basically a two-sided, high resolution, stochastic simulation in which ground combatants include tanks, antitank guided missiles, field artillery, and air defense systems appropriate for brigade level combat. Air systems are currently limited to helicopters, and systems are available for delivery of chemical and nuclear munitions. Minefields are also represented in the model. Successful games have been conducted at brigade level, and future applications at division and possibly corps level are planned.

- MTM - McClintic Theater Model

The McClintic Theater Model (MTM) was developed at the Army War College for use by student officers. It is an interactive wargame with both RED and BLUE sides represented by players. The original model has been extensively modified and enhanced by VII (US) Corps and has been used to drive corps CPX. The VII Corps version of MTM is addressed in this report.

Some important features of MTM are:

- Easy to Use (Free-Form Keyword Inputs)
- Input Checking/ Verification
- Variable-Size Hexagonal Grid Terrain
- Applicable to Any Part of the World

- Easy to Modify (Top-Down Structured Program)
- Restart Capability
- Multiterminal Operation
- Manual Simulation of External Events
- Compatible with Graphics Hardware
- Time Driven (Not Red/Blue Turns)

- STAR - Simulation of Tactical Alternative Responses

STAR is a brigade level combat model in which all systems are represented at the individual weapon level. It is a closed, stochastic, high resolution, simulation model of two-sided combined arms air land combat. The original work (1978-1980) was done primarily by students at the Naval Postgraduate School with assistance from faculty members. In July, 1980, responsibility for the model development was assumed by the TRADOC Research Element, Monterey. The ultimate goal of STAR is to simulate the combined arms battle at the brigade level on realistic ter ain using individual tank, infantr an, field artillery piece, attack helicopter, and other individual systems as the entities modeled.

- TACSIM - Tactical Simulation

TACSIM is a one-sided interactive, stochastic, high resolution simulation model of U.S. intelligence collection sensor systems observing the enemy theater level force array. TACSIM provides controller mechanisms, intelligence output reports, and a combat scenario environment for simulating intelligence processes to stimulate the command decision making processes. TACSIM models a variety of reconnaissance, surveillance, target acquisition, and electronic warfare

assets as they are tasked against the time-phased events of enemy movement and electromagnetic operations on the battlefield and provides Intelligence and Electronic Warfare (IEW) reports to the command and control elements.

- VECTOR - 3

  The VECTOR-3 model is a deterministic computer simulation of conventional, mid-intensity combat at theater level. The simulation does not require human intervention other than to provide initial inputs. Although designed as a theater-level model, VECTOR-3 can be used to simulate combat at corps and division levels. The level of resolution for theater simulations is battalion, while company level resolution is used for corps simulations. Missions, resource allocations, and tactical decision rules are input to VECTOR-3. The tactical decision rules are used to represent the command and control processes of subordinate units at a level of detail determined by the user.

These simulations are reviewed in the report. The general model characteristics and their representation of the required functional areas are compared. The prospects for use as a development base are evaluated against a set of development criteria. A comparison is presented of the shortfalls of these models in meeting the short-term requirements. This comparison is used as the basis for an estimate of the level of effort required to upgrade the model to satisfy the requirement. Finally, a comparison is presented of the estimated risk to, and cost of the short-term development program using these models as the base of that development. Table 2 shows a summary of these comparisons.

The comparisons show ARTBASS to be the most appropriate choice as the base for a short-term development program. It provides the highest degree of satisfaction of the development criteria, the lowest expected level of effort to meet the requirement, the lowest risk to the development, and the lowest estimated cost. The technical approach is, therefore, based on ARTBASS as the starting point.

Table 2. Summary comparisons of candidate models.

SHORT TERM DEVELOPMENT CONSIDERATIONS	CANDIDATE MODELS						
	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR-3
Satisfaction of Development Criteria (Ranking)	First	Sixth	Third	Second	Seventh	Fourth	Fifth
Effort To Overcome Shortfalls	Low	High	High	Moderate	High	High	High
Risk	Low	High	Moderate	Moderate to Low	High	High	High
Cost	Low to Moderate	High	Moderate to High	Moderate	High	High	High

The recommended approach for achieving the short-term command group training system capability consists of three phases; baseline (ARTBASS) modification to accommodate division level simulation, baseline enhancement to provide representation or improved representation of functions required for division level training, and system configuration design and implementation. The system configuration management phase will provide control of the other phases and insure a logical development sequence for demonstration of the incremental increases in capability.

Modifications will be required to ARTBASS in the following areas:

- Division Level data base - Data bases will require significant expansion to accommodate the personnel, equipment, and units in a division level simulation. Combat engagements should be resolved at company level with decision rules applying the battalion level control of those units. Brigade level role players (controller) will provide input and control of the battalions in the force.

- Task organization - A task organization capability will be required to allow changes in resource allocation to and within battalions as directed by division.

- Alert aggregation - The control of battalions by brigade level controllers will require the aggregation of events, data, and reports to provide controller alerts at the higher level.

- Terrain data base resolution - The representation of larger units and the greater size of the battlefield will necessitate a change in terrain resolution. A change in resolution from 25 meter squares to 100 meter squares per data point will reduce processing requirements without sacrificing fidelity of the simulation.

- Time step control - Event and status updates can be changed from one minute to two minutes. This will again decrease the processing requirements and should be adequate for information and data requirements at division level.

- Detection and engagements - The simulation of larger size units will require modification of the detection and engagement logic in ARTBASS. The level of detail will be simplified to be consistent with the larger units.

- Operational state processing - The decision rules controlling the movement, detection, and engagement will require modification to reflect the doctrine and activities of the larger units being simulated.

- Environment representation - The representation of environmental factors; weather, ambient light, background contrast, temperature, wind noise, etc will need to be simplified to be consistent with the representation of larger units.

- Training feedback - The training feedback capability will require significant expansion to provide data for division command group analysis and indications of additional training needs.

Enhancements to the baseline will be required to allow realistic representation and role playing of many functions not required in ARTBASS, but which are of critical importance to division command group training. Enhancements will be required in the following areas:

- Administrative/Medical
- Corps Resupply
- Maintenance
- Electronic Warfare
- Intelligence
- Transportation

- Fire Support Decision Logic
- Engineering Support Decision Logic
- Air Defense Artillery
- Air Strike and Air Lift

The enhancements can be dev°eloped from the techniques and models currently existing in other simulations.

The hardware configuration recommended for the training system is shown at Figure 1. This configuration is based on the cluster concept of computers and data storage devices with high speed data connections. The configuration shown will allow some redundancy and allow a degraded, but significant capability even with the failure of one of the computers. This configuration will also allow the incremental expansion of the system through the development period. The controller station requirements are estimated at 12 to 18. The configuration shown will adequately accommodate this requirement. If the lower number of controller stations is adequate, one of the VAX 11/780 machines would not be needed. This, along with the reduction in controller stations, would reduce estimated costs from $1.425 million to $975 thousand, but would also significantly decrease the system backup and expansion capabilities.

The long-term (five to six years) development program for a division/ corps command group training system is addressed through assessments of equipment and simulation technology. In this time frame equipment capabilities will improve but no significant breakthroughs can be foreseen which would have significant impact on this program. Higher resolution of the simulation may become possible through these improved capabilities. Additional automation of role player/controller functions and enhancement of the man-machine interface will provide more realistic simulation to the training audience and possibly allow decreases in controller requirements. Improvements will be possible in the training feedback as experience is gained by use of the short-term capability.

The recommended long-term (approximately six years) approach is to continue the incremental development of the training system developed in the short-term. The division level system should be expanded to accommodate corps level training. This will require the addition of modules to support role players of the corps subordinate units and to provide some aggregation of division functions for role playing that level and integrate the tactical and operational aspects of combat. Some corps level simulation capability will be required to interface with division level models to allow several divisions, some live and some

simulated (role played), to be subordinate to the corps. Additionally, network and communications capability improvements should be closely monitored for possible exploitation of "work station" technology.

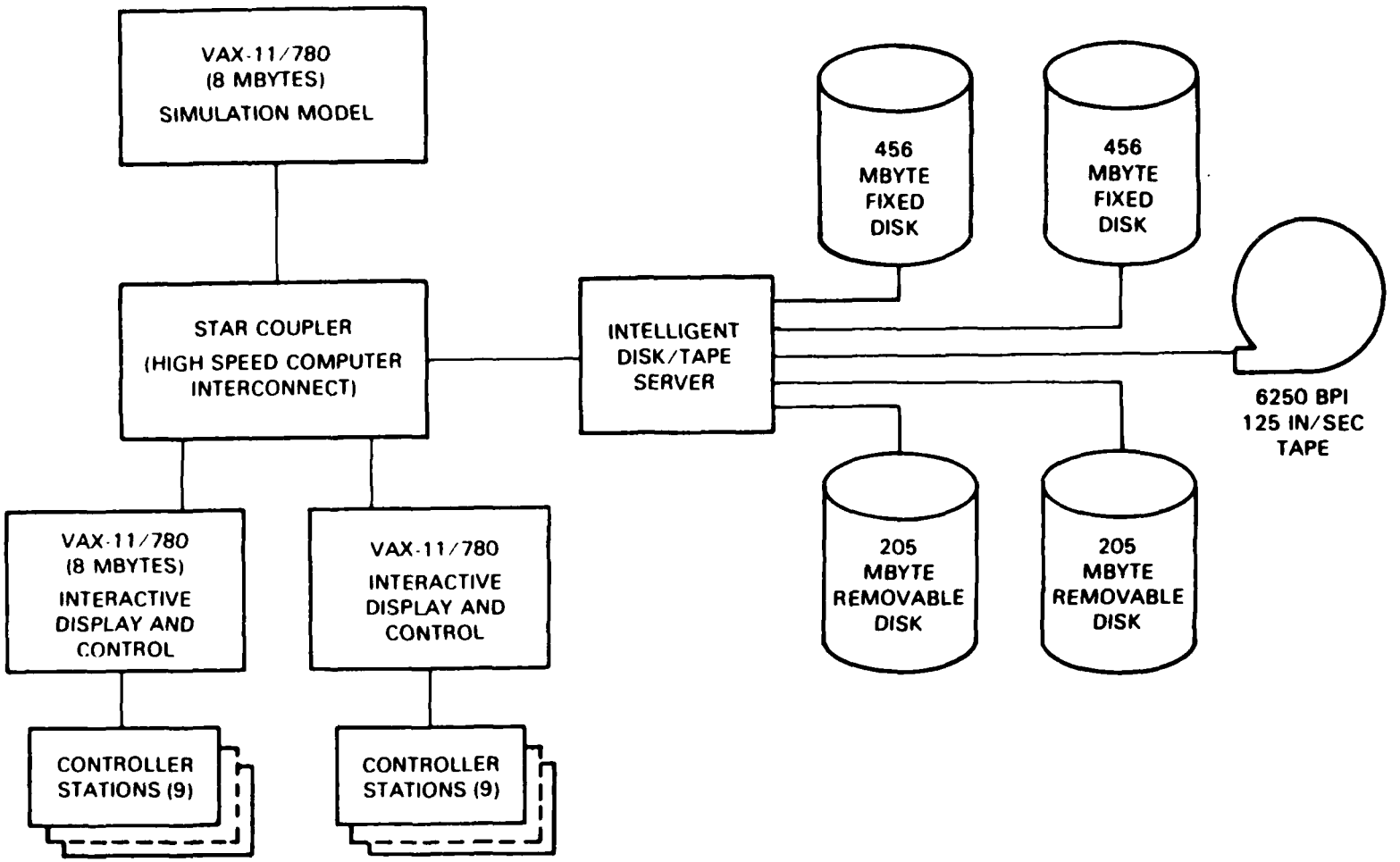


Figure 1. Hardware configuration.

Technology improvements in the 10-15 year time frame may provide capabilities significant enough to warrant construction of a completely new simulation for the training of division and corps command groups. Technology projections resulting from an in-depth study should be used to guide the design of a flexible, adaptable simulation system integrating new hardware and software technology projected for that period.

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SECTION 1

INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide assistance to the Operations and Training Simulation Division (OTSD), CAORA, in establishing the best technical approach for development of a training simulation for use by division and/or corps command groups.

1.2 SCOPE

To accomplish this purpose the developmental approach has been considered from both short term and long term aspects. Short term is defined as what can be done to meet most of the requirements with a fielded system in a 24 month time frame. Long term is defined as the optimum system to fill the division/corps training simulation requirement given a 4-6 year development effort.

Since the requirements for a simulation to be used in division/corps command group training have not been well defined, Chapter 2 provides a discussion of this area and provides the basis for the recommended development approaches. Chapter 3 provides an examination and discussion of selected existing simulations which might provide the foundation for the division/corps training simulation. Chapters 4 and 5 provide recommendations for development approaches for the short and long term respectively.

First, a brief introduction to the organization, mission, and functions of the US Army division and corps is provided.

1.3 THE DIVISION

1.3.1 Introduction

The division is a relatively self-sufficient and flexible combat organization. It is the primary combat element of a corps organization, which generally consists of from two to five divisions. Currently the US Army has five basic types of divisions: infantry, armored, mechanized, airborne, and air assault. Divisions may be assigned to a corps in any combination and may be reassigned between corps as dictated by the operational situation or mission of the corps.

1.3.2 Operational Concept

The operational concept of the division is determined by the type of division as discussed below; however, the basic mission of any division is to destroy the enemy armed forces and to control land areas, including the population and resources.

1.3.2.1 The Infantry Division -

The infantry division is a combined arms force of maneuver, combat support, and combat service support units. The infantry division does not have the mechanized assets to close with the enemy's heavy forces in terrain suitable for mechanized operations; rather, it is more effectively employed in terrain favoring dismounted operations, such as urban areas, mountains, and jungles. The infantry division is soldier-centered. When engaged in combat, the infantry division is predominantly footmobile.

1.3.2.2 The Heavy Division (Armored/Mechanized) -

The heavy division has large amounts of mobile, armor protected firepower. It is normally employed where battles are fought over large areas against an enemy with similar capabilities. During offensive operations it attempts to rapidly concentrate overwhelming combat power against the enemy, break through the defense, then strike deep in enemy territory. The heavy division can defend on a wide front using mobility to rapidly concentrate against an enemy main attack, while economizing forces in less heavily attacked areas.

1.3.2.3 The Airborne Division -

The airborne division is organized to be rapidly deployed anywhere in the world. It can secure critical installations, reinforce US and Allied forces, and conduct a show of force. It can conduct a parachute assault or it can be airlanded. It can also conduct air assault operations as well as other missions normally assigned to infantry divisions. The airborne division does not have the staying power of the other divisions.

1.3.2.4 The Air Assault Division -

The air assault division conducts operations by transporting infantry battalions with necessary combat support and combat service support into battle by helicopter. Once on the ground they fight much like the infantry division but can be redeployed rapidly using organic aviation assets. Like the airborne division, it lacks some sustaining capabilities.

1.3.3 Organization

The capabilities of the division can be varied based on the task organization. A type division can:

- Conduct sustained combat operations.
- Operate in difficult weather and terrain.
- Operate as part of a joint force.
- Conduct tactical operations in an NBC environment.
- Provide organic combat support.
- Provide interoperability with host nations.

The division is a flexible organization and in combat will be changing frequently to meet the needs of the tactical situation. Brigades and maneuver battalions are the units normally task organized. Changes in the task organization will cause changes in support provided by other elements, such as division artillery and the division support command.

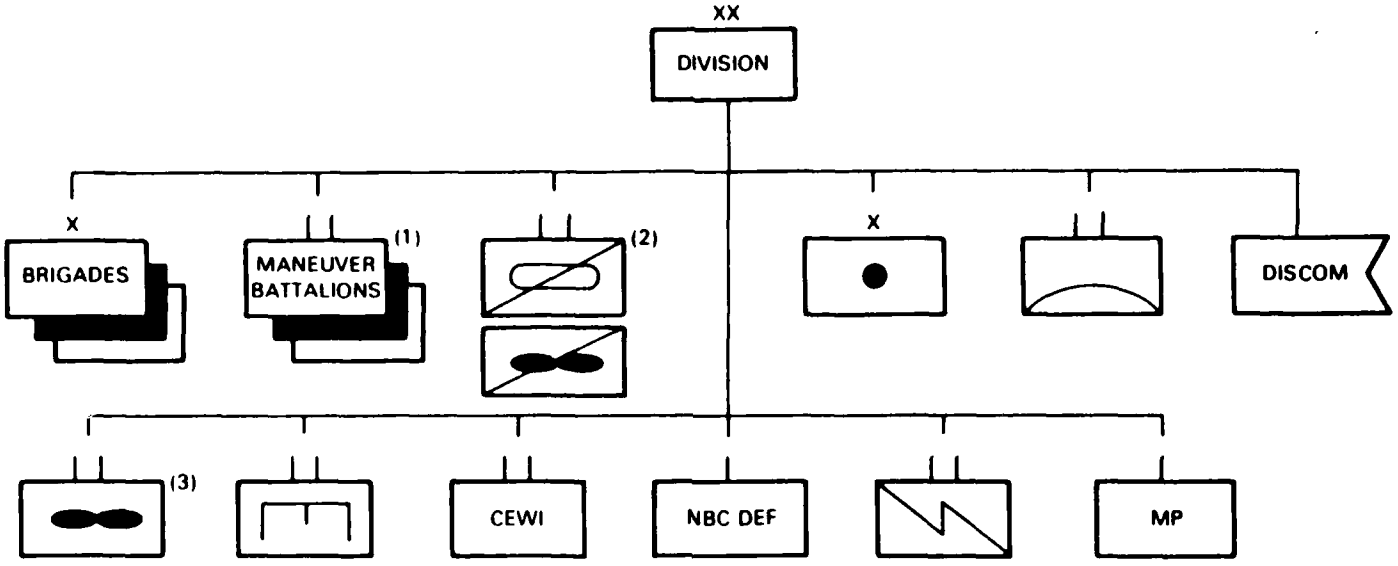
Figure 2 shows the general division organization.

1.3.3.1 Divisional Subordinate Units -

- The Brigades. Brigades are the major subordinate maneuver commands of divisions. The only permanent unit assigned to a brigade is its headquarters and headquarters company. Battalions are attached to the brigade to perform the tactical mission. The brigade is normally assigned three or four maneuver battalions and the necessary combat support and combat service support. Sustaining combat support and combat service support may come from division or corps support units.

- Division Artillery. Division artillery is the command and control headquarters for the field artillery battalions of the division. It has a headquarters and headquarters battery, target acquisition battery, and the required number of firing battalions depending upon the tactical situation and the task organization.

- Division Support Command. The division support command is the command and control headquarters for the combat service support units of the division. The command is responsible for the administrative, logistical, maintenance, and medical support of the division and will have subordinate organizations assigned to meet those needs of the division being supported. A type



(1) NUMBER AND TYPE WILL VARY BY DIVISION TYPE.

(2) ARMD CAV SQDN IN ARMOR AND MECH DIV, AIR CAV SQDN IN INF, ABN, AND AA DIV

(3) AVN GROUP IN AIR ASLT DIV

Figure 2. Type division.

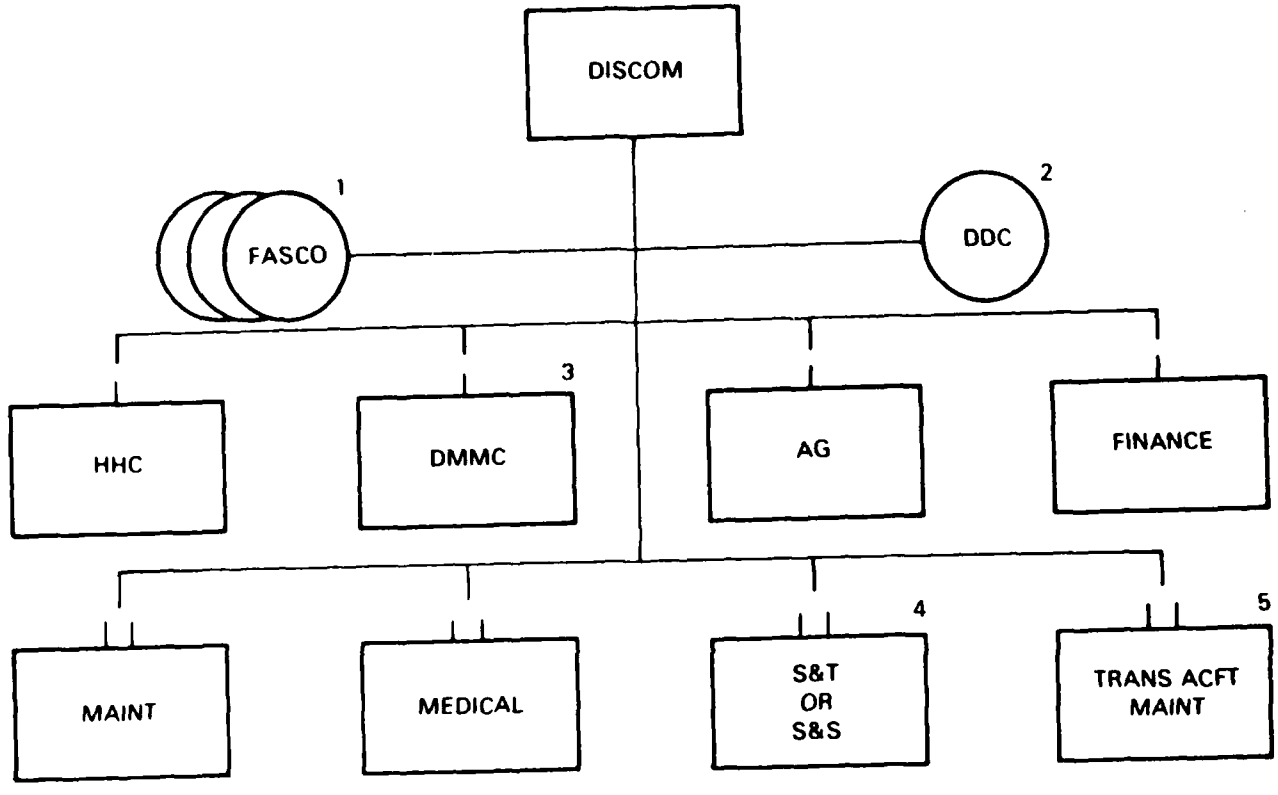
division support command is shown at Figure 3. This organization will be changed somewhat by Division 86 reorganization.

- Air Defense Battalion. An air defense battalion is organic to the division to provide air defense for forward combat elements against low altitude hostile aircraft. Additionally, the battalion can provide air defense to divisional assets based upon assigned priorities. The weapons are employed in accordance with the principles of mass, mix, and mobility and are integrated into the commander's scheme of maneuver.

- Aviation Battalion. The aviation battalion provides support for the division headquarters, for the support command, and for divisional units without organic aircraft. Additionally, the battalion provides general support and reinforcement aircraft to units possessing their own aircraft.

- Engineer Battalion. The engineer battalion is used to increase the combat effectiveness of the division by means of engineer combat support and general engineer work. It operates as a member of the division combined arms team by performing mobility, countermobility , survivability, and general engineering missions. The battalion plans and assists in river crossing operations and fights as infantry when required.

- Signal Battalion. The signal battalion provides area signal communications support to the division. It provides communication facilities for the tactical operations center, and the division main and the rear command posts. Additionally, it establishes communications with the brigade command posts and the division artillery and support command headquarters.



1 FORWARD AREA SUPPORT COORDINATOR
2 DIVISION DATA CENTER
3 DIVISION MATERIAL MANAGEMENT CENTER
4 S&S Bn IN Abn AND AA DIV, S&T Bn IN OTHERS
5 AIR ASLT DIV

Figure 3. Division support command (DISCOM).

- Combat Electronic Warfare Intelligence Battalion. The CEWI battalion is a fully integrated intelligence electronic warfare unit. It provides electronic warfare in general support of the division as well as surveillance, interrogation, and operations security in general support of the division and/or direct support of the maneuver brigades and battalions. The battalion may be augmented by attached assets from the corps.

- The Cavalry Squadron. The squadron is a combat maneuver force of combined arms which performs reconnaissance and provides security for the division. It engages in offensive and defensive actions as an economy of force. The squadron is organized and equipped to rapidly react to changing situations, to find and engage the enemy, to develop the situation, and to provide the brigades reaction time and space to maneuver against the enemy forces. An Air Cavalry Squadron is normally organic to the Infantry, Airborne, and Air Assault Divisions. Armored Cavalry Squadrons are organic to the heavy divisions.

- Other Elements. In addition to the organizations discussed above a division will have several company-size units designed to fulfill certain functions. Examples are the Military Police Company, the Nuclear/Biological/ Chemical Defense Company, and the Headquarters Company.

1.3.3.2 Division Staff Organization -

The division staff is concerned with combat, combat support, and combat service support functions. Primary emphasis is placed on planning and supervising the execution of tactical operations. Coordinating staff officers are designated in five broad fields of interest. They are:

- AC of S, G1, Personnel
- AC of S, G2, Intelligence
- AC of S, G3, Operations
- AC of S, G4, Logistics
- AC of S, G5, Civil-Military Operations

The special staff officers serve in functional areas and some of them also serve as subordinate unit commanders. A typical division staff is shown at Figure 4.

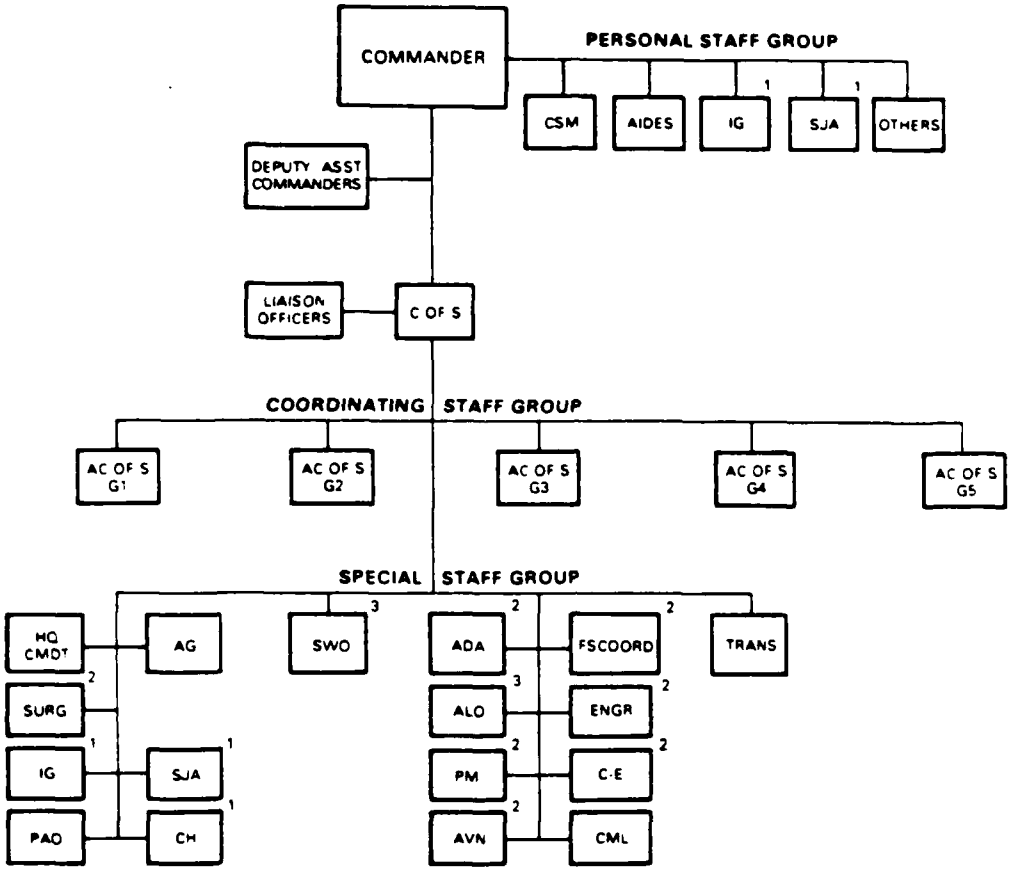
The key functions of the coordinating staff group (G1-G5) are listed in Table 3.

1.3.3.3 Command Posts -

The Command Post (CP) is the principal facility employed by the commander for command and control of combat operations. A command post consists of those coordinating and special staff activities and representatives from supporting army elements and other services that are necessary to direct and supervise operations. The division headquarters is adaptable to organizing into tactical, main, and rear command posts. Normally at brigade and lower echelons the personnel and equipment limitations restrict operations to only main and rear command posts.

- Tactical Command Post (TAC CP). The tactical CP is the forward echelon of the headquarters. It normally consists of the commander, G2, G3, fire support, tactical air control party, air defense artillery and combat service support liaison elements. It is located well forward on the battlefield so the commander is in close proximity to subordinate commanders and can directly influence the action. Movement of the tactical CP is dictated by the flow of the battle and the desires of the commander. Figure 5 is a block diagram of the major elements of the TAC CP.

- Main Command Post (MAIN CP). The main CP normally operates under the control of the Chief of Staff. If consists of those staff elements involved in sustaining current operations and in



1 DIRECT ACCESS TO THE COMMANDER AS A PERSONAL STAFF OFFICER AS REQUIRED. THE IG AND THE SJA, BY REGULATION (AR 20-1 AND 27-1), WILL BE MEMBERS OF THE PERSONAL STAFF GROUP

2 ALSO SUBORDINATE UNIT COMMANDER

3 PROVIDED BY US AIR FORCE

NOTE SPECIAL STAFF SECTIONS HAVE BEEN GROUPED UNDER THE COORDINATING STAFF SECTION RESPONSIBLE FOR PRIMARY STAFF COORDINATION

Figure 4. Division Staff Structure.

Table 3. Principal functions of the coordinating staff.

G1	G2	G3	G4	G5
PERSONNEL	INTELLIGENCE	OPERATIONS	LOGISTICS	CIVIL AFFAIRS
Unit strength maintenance Personnel Services Support (replacement) - Morale (band, etc) - Admin. - Health Services - Chaplain - Legal - Postal - Finance - Public Affairs support Discipline, law, and Order Civilian Personnel Admin. Sgt. for PWs Rear Area Protection (staffing) Safety Headquarters Management (Movement, support, manning, etc.)	Intelligence production - Recommend recon - Process incoming intel - Coordinate gathering - Intel briefings - Fallout prediction (enemy use) - Recommended targets *Counter-intelligence* Intelligence training Electronic Warfares Unconventional warfare recommendation Map requirements Use of SCI data	Operations - Estimate of the situation - SOPS - Plan and Orders - Critical resource allocations - Task organization - Coordination of maneuver and support - Nuclear and chemical weapon requirements - Organizaing combat units (Force development) - Training	Supply requirements monitor request and receipt of supplies Supervise distribution of critical supply rate (CSR) items Property Maintenance operations Transportation Services - Planning construction - Real estate acquisition and disposition - Food services - Bath and laundry - Graves registration Location services/ support areas Recommend MSRs	Civil-Military operations (CMO) Requirements for civil affairs units Government, economic, public facilities, displaced persons, refugees, cultural affairs, and civil information

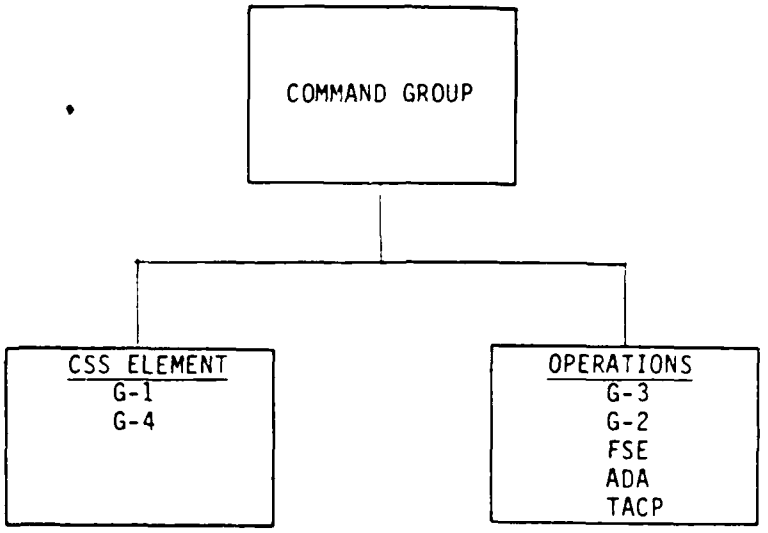


Figure 5. Division tactical command post.

planning future operations. The focal point for these operations is the Tactical Operations Center (TOC) of the main CP. Normally all staff elements of the division headquarters are located in the main command post. The TOC is made up of the G1, G2, G3, G4, G5, Airspace Management, Fire Support, NBC, Tactical Air Control Party elements. The location of the main CP is well to the rear, out of range of most enemy artillery. Figure 6 provides a schematic of the MAIN CP showing the major elements normally operational there.

- Rear Command Post. The Rear CP is the rear echelon of the headquarters. It normally is controlled by the Assistant Division Commander(S) and consists of G1, G4, G5, Adjutant General, Staff Judge Advocate, Inspector General, Provost Marshall, and other supporting staff elements. The rear command post will normally be near or collocated with the division support command. Figure 7 provides a schematic of the major elements of the Rear CP.

- Staff Operations. Considerations in developing an optimum command post organization are improved communications and the enhanced ability to obtain information rapidly and to react promptly. The timely receipt, distribution, storage, and retrieval of information pertaining to current operations are key to effective staff operations. Automated and manual information systems must minimize the time required for administrative processing of information, insure an accurate portrayal of the tactical situation, prevent needless verification of data, and make correct information immediately available to all appropriate staff elements.

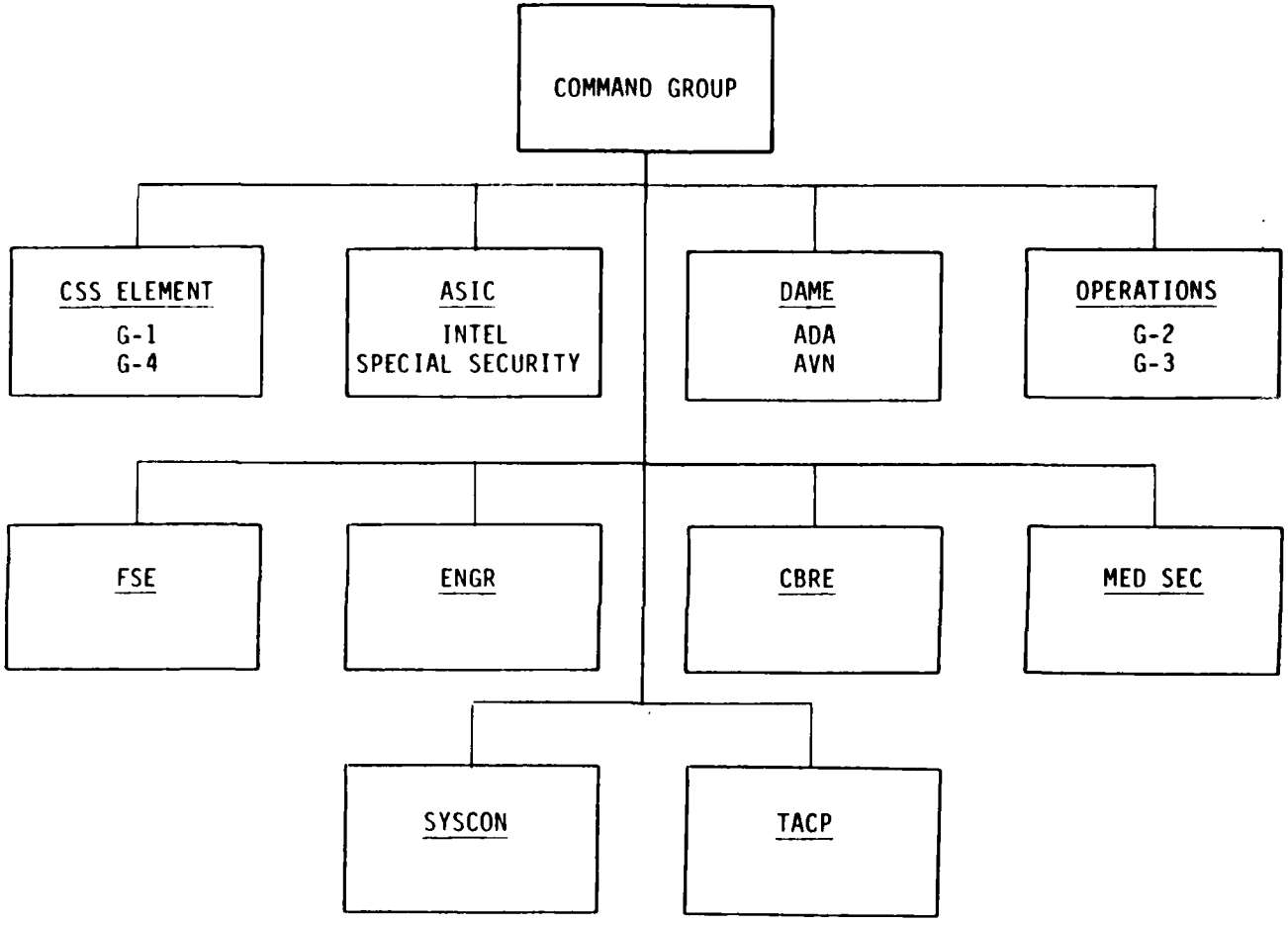


Figure 6. Division main command post.

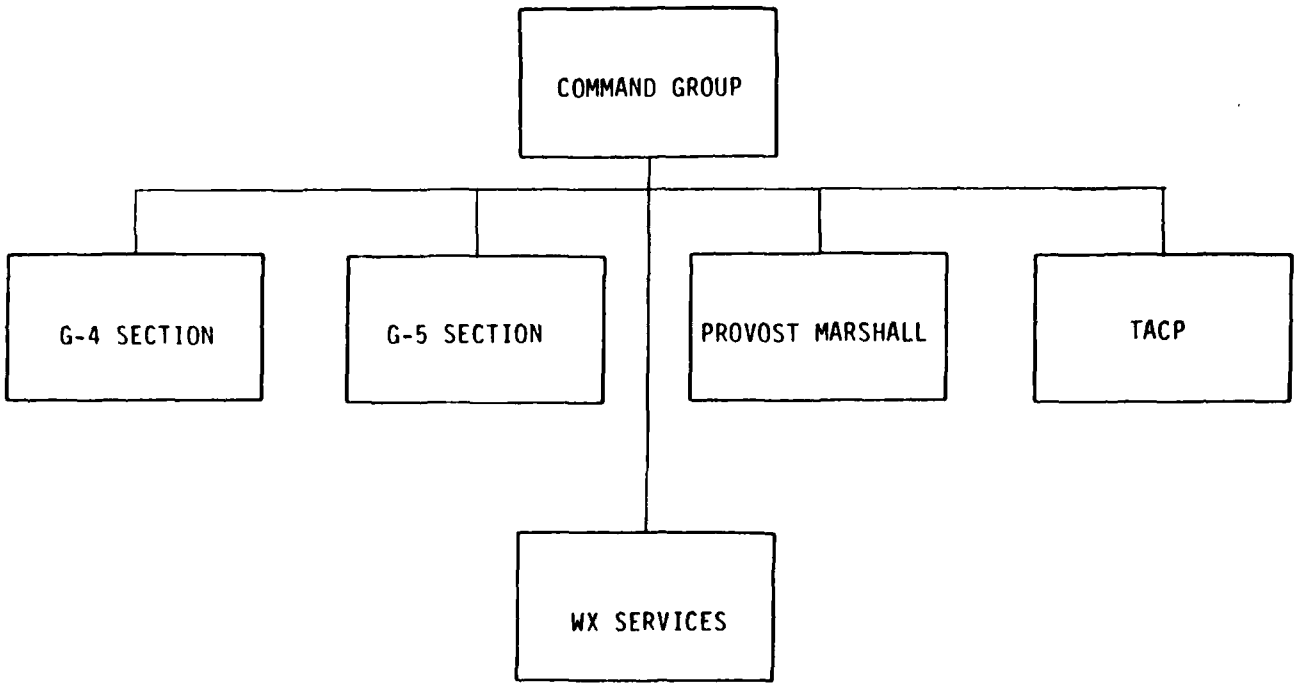


Figure 7. Division support area (rear) command post.

1.4 THE CORPS

1.4.1 Introduction

The corps is the US Army's largest tactical unit and is organized to perform major operational and tactical tasks, taking an active part in directing campaigns and fighting battles. The corps, as an organization of the Army in the field, may operate either as a separate unit or as one of several corps under a theater army. The corps as an entity has existed since the days of Napoleon and played a critical role as a maneuver force in virtually all major recent conflicts involving US forces. In the early 1970s, the US Army realigned its headquarters echelons for improved command and control, eliminating the field army and passing many of the tasks for personnel support and logistics to corps level. A corps today has some required elements but is largely a flexible organization which is made tactically, logistically, and administratively self-sufficient by tailoring for the operational mission to be achieved. As such, the current US Army Operational Concept doctrine (AirLand Battle) plays an important part in structuring corps missions and, therefore, deserves treatment for a complete understanding of how the corps would be expected to fight on the modern battlefield.

1.4.2 The Operational Concept

The Army's current operational concept is expressed in its AirLand Battle doctrine, based on securing and/or retaining the initiative and exercising it aggressively to defeat enemy forces. All operations are designed to put the enemy off balance with a powerful initial blow from an unexpected direction and then to follow-up rapidly to prevent his recovery. The concept requires that initiative, depth, agility, and synchronization characterize all corps combat operations and calls for the coordinated use of air and ground maneuver, all means of fire support, and use of all available combat support and combat service support throughout the entire corps area of operations. The concept places an emphasis as never before on rapid and effective command and control, as well as on the use of initiative on the part of subordinate unit commanders. The corps maneuver forces must seize and retain the initiative if it is to win; therefore, the corps must fight aggressively in the defense to halt the enemy,

seize the initiative, and shift to the attack at the earliest opportunity.

In addition to battlefield initiative, the corps commander must pursue the battle in depth, positioning his forces to accommodate the nonlinear actions along a rapidly changing Forward Edge of the Battle Area (FEBA) and observing activities well to the front and flanks of the corps area. This will allow the commander to pursue aggressive surveillance, reconnaissance, strike, and maneuver operations at extended ranges, thus anticipating enemy moves and permitting deep interdiction of following echelon forces. In formulating courses of action, the corps planners must insure that all combat operations contribute to attaining the commander's goal through a single, comprehensive concept of operations.

A vital capability to support the operational concept is the ability of a corps to move quickly in directions vital to its operations. This agility is achieved through plans which are simple in design, are oriented on the mission but do not unnecessarily restrict maneuver options, and yet are flexible enough to accommodate rapid changes in the tactical situation. To a large degree, this flexibility is a function of the initiative of major commanders, unit training, and the operational techniques utilized by the corps staff.

Perhaps the most difficult of all concepts to achieve on the modern battlefield is that of synchronization, which involves the coordination of the use of maneuver, fire support, deep attack, mobility and countermobility, electronic warfare, and combat service support in the aggressive pursuit of the corps mission. This places vital importance on the effective use of command and control, while also stressing the importance of plans that allow subordinate commanders to use their initiative in the absence of reliable communications.

In summary, the physical damage and psychological shock of battle on the enemy can be magnified by the sudden and coordinated use of heavy fires and rapid maneuver of air and ground units over unexpected and often indirect approaches chosen to strike at the flanks and rear of enemy units. The corps will attempt to stun and overwhelm its opponents by fighting campaigns of considerable movement and violence. Penetrations by either side are likely, making linear warfare a temporary condition, and blurring the distinction between rear and forward combat areas. Combat electronic warfare, as well as mobile warfare, will place a premium on independent actions by division and brigade commanders for seizing the initiative and establishing a combat advantage over the opponent. Airmobility and

airpower will extend the battle to new depths on both sides, and material will be consumed in enormous amounts during periods of intense battle. Obviously, the spectrum of modern warfare is wide, and the possibilities for tactical combinations on the battlefield are nearly infinite. Thus, the need for a flexible corps organizational structure that will accommodate the task organizations dictated by the various operational missions.

1.4.3 CORPS ORGANIZATION

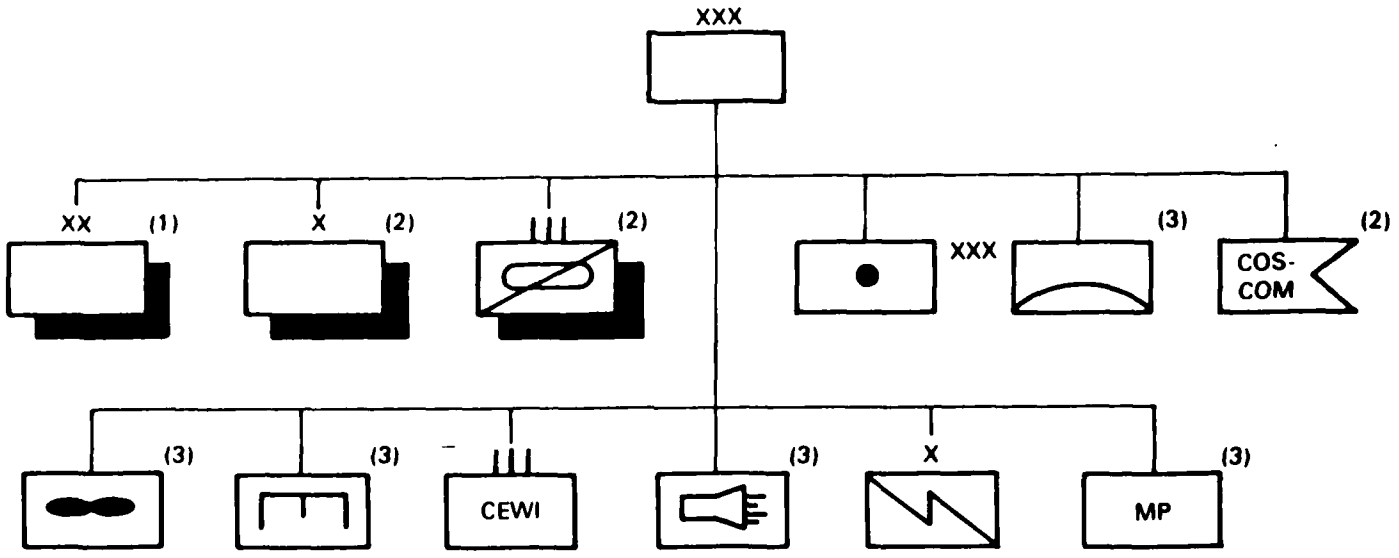
This section describes the organization of the corps, its command and staff arrangements, and its constituent units. As was stated previously, each corps is individually structured for the specific requirements of its mission in accordance with the following factors:

- Nature and expected duration of the mission
- Characteristics of the area of operations
- Enemy characteristics and capabilities
- Available forces
- Available support from other sources (Theater Army, other services, allies)
- Available time for deployment or reinforcement.

Generally a corps will consist of from two to five divisions, a corps artillery force, a corps support command, and a number of separate combat, combat support, and combat service support units that range in size from companies to brigades. A sample corps organizational structure is provided in Figure 8.

1.4.3.1 Corps Subordinate Units -

The corps must be able to employ any of the Army's smaller operational units in the use of combined arms forces in accomplishment of the mission. The combat and combat support units normally available to a corps are described below.



(1) TWO TO FIVE

(2) NUMBERS AND TYPES OF UNITS WILL VARY WITH REQUIREMENTS.

(3) THE SIZE OF THE COMMAND AND CONTROL HEADQUARTERS WILL DEPEND ON THE SCOPE AND MAGNITUDE OF ITS MISSION TO INCLUDE THE NUMBER OF SUBORDINATE UNITS ASSIGNED.

Figure 8. Sample Corps organizational structure.

- Divisions. The divisions within a corps may be of any type (mechanized infantry, infantry, armored, air assault, or airborne) and may be in any combination (normally two to five in number) to meet the operational situation. Although line divisions have their own combat support and combat service support assets, the corps has overall responsibility for insuring that its subordinate divisions are adequately supported, and may be required to fill unique support needs.

- Armored Cavalry Regiments (ACRs). ACRs are normally assigned one per corps and perform reconnaissance and security operations for the corps. A regiment's organic air and armored cavalry units can operate as a combined arms team over wide areas at an extended distance from the main combat force. In this mode, an ACR may engage in offensive, defensive, or delaying actions in an economy of force role designed to accomplish a number of different missions (screen, find the enemy main thrust, allow main thrust force to take up new positions). The corps ACR is an especially effective force under the AirLand Battle concept due to its ability to conduct rapid, violent, and unexpected attacks coupled with its inherent high mobility capability.

- Separate Brigades. Separate infantry, mechanized, airborne, or armored brigades may be assigned to the corps and can perform a variety of missions, to include rear or flank security, corps reserve, or division reinforcements.

- Special Forces. The principal role of Special Forces (SF) is to conduct unconventional warfare within the theater of operations, usually through guerrilla forces which SF units are specially equipped to train, organize, equip, and advise. Some of the special missions which SF forces can conduct

include interdiction of enemy lines of communications, destruction of military and industrial facilities, the conduct of psychological warfare, and reconnaissance in the enemy's rear areas.

- Ranger units. Ranger companies and battalions are specially organized, equipped, and trained to conduct special tactical tasks, often close to or behind enemy lines.

- Aviation Group. Combat aviation and attack helicopter units provide lift, reconnaissance, and firepower support for corps operations. Attack helicopter (AH) units from the corps aviation group or an assigned air cavalry combat brigade are a vital part of the combined arms force available for corps combat operations. Being versatile and extremely mobile, they can participate in the deep battle as well as perform a number of other missions similar to the ACRs. AH units have the ability to mass fire rapidly and dominate terrain, although they cannot hold terrain and their deployment is contingent upon the weather.

- Corps Artillery. Field artillery cannon and missile battalions of a corps are usually organized into field artillery brigades. These brigades plus any separate battalions retained by the commander are used in general support of the force, as reinforcement of organic divisional artillery (DIVARTY), in direct support of corps troops, as a means of weighting the main effort of the corps, or to influence the action in a critical area. Cannon, rocket artillery, and long-range missiles (Lance) assets are usually retained as a means of fighting in depth throughout the corps area of influence and are often used in the interdiction of follow- on echelons of the enemy force.

- Engineer Brigade. Corps engineers provide mobility, countermobility (obstacles), survivability, general engineering, and topographic engineer support services for corps operations. This support also includes the use of atomic demolition munitions (ADM). Corps engineer units may be allocated in direct support of maneuver forces or may be retained in general support for concentrated use where the tactical situation dictates.

- Air Defense Artillery (ADA). Corps ADA units provide air defense coverage of the corps assets according to the priorities of the respective commanders. Corps assets which typically receive defense priority include command posts (CPs), signal sites, artillery units, marshalling areas, or combat service support installations. An ADA force supporting a corps can consist of high-to-medium altitude missile battalions (Improved Hawk, PATRIOT), and short range air defense (SHORAD) battalions (Sgt. York Gun, Vulcan, Chaparral), which also include man portable systems (MANPADS) such as Stinger. Even when in the direct support/attached roles, ADA units are subject to theater air defense rules and procedures, with coordination of airspace management within the corps area, a responsibility of the corps staff (Corps Airspace Management Element, CAME).

- Signal Brigade. The brigade has responsibility for installation and maintenance of a reliable and responsive communications system in the corps area and for connection of that system to both higher and lower levels of command.

- Military Police Brigade. An MP brigade normally supports the corps, assisting in expediting the movement of resources on the main supply routes (MSRs) securing critical facilities, conducting

rear area combat operations and evacuating prisoners of war from the divisions.

- Military Intelligence (MI) Group (Combat Electronic Warfare and Intelligence, CEWI). Intelligence and electronic warfare operations are conducted in the corps area by the MI Group, which provides a systematic exploitation of the enemy through collection, production, and dissemination of combat intelligence and through offensive EW operations.

- Chemical Units. A corps is usually provided with nuclear, biological, and chemical (NBC) reconnaissance units for monitoring the battle area and recommending protective measures. These units also include decontamination and smoke generation capabilities.

- Psychological Operations (PSYOPS). When available, PSYOP Battalions will support the corps, with many missions closely associated with civil affairs operations.

- Civil Affairs. These units, often broken down into teams, are assigned the mission of limiting civilian interference with military operations, assisting in the location and acquisition of local resources as needed, and assisting in meeting the commander's local and moral responsibilities toward the civilian population.

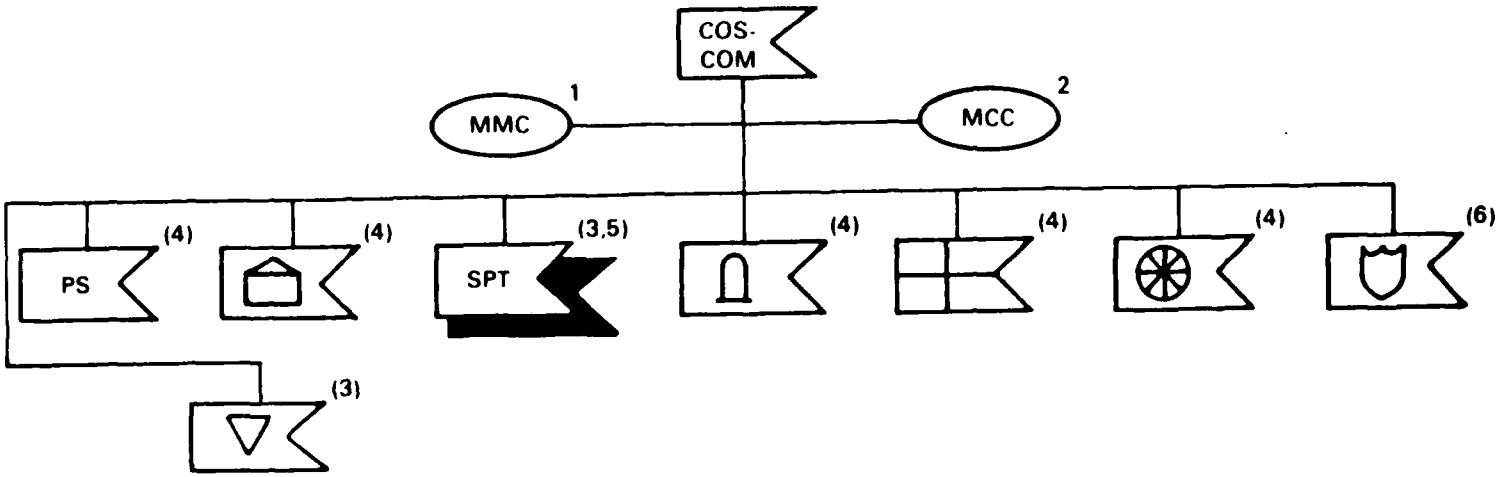
- Rear Area Operations Center (RAOC). Due to the critical nature of the corps rear area to sustained combat operations, a RAOC is usually established for command and control of rear area protection and operations.

- Corps Support Command (COSCOM). Combat service support (CSS) is provided to the corps by the COSCOM. The COSCOM is organized to meet the personnel, administrative, logistical, and medical needs of the corps. The COSCOM is, therefore, also a flexible organization containing CSS units designed to support the corps that it serves. The COSCOM is a large organization performing a multitude of functions necessary to sustain the corps in combat. Figure 9 shows a type organization of the COSCOM.

1.4.3.2 Corps Staff Organization -

The primary function of the corps staff is to assist the commander in the allocation of resources and deployment of forces required to concentrate and defeat the enemy. As the Army's largest combat organization the staff is also responsible for translating national strategy into the battlefield tactics of those deployed forces. The corps staff organization may be modified to meet the special requirements of an operation and the desires of the commander. As a minimum, the corps headquarters must be capable of:

- Effective command and control of the assigned units.
- Continuous operation.
- Operating from multiple sites and during displacement.
- Continuous communications with higher and lower headquarters.
- Timely reception, analysis, and presentation of information that is critical to the commander.



(1) MATERIAL MANAGEMENT CENTER

(2) MOVEMENT CONTROL CENTER

(3) NUMBERS AND TYPES OF UNITS WILL VARY WITH REQUIREMENTS.

(4) THE SIZE OF THE COMMAND AND CONTROL HEADQUARTERS WILL DEPEND ON THE SCOPE AND MAGNITUDE OF ITS MISSION TO INCLUDE THE NUMBER OF SUBORDINATE UNITS ASSIGNED.

(5) PROVIDE DS SUPPLY AND MAINTENANCE TO NONDIVISIONAL UNITS, BACKUP DS SUPPLY AND MAINTENANCE TO DIVISIONAL UNITS, AND GS SUPPLY AND MAINTENANCE IN SUPPORT OF ENTIRE CORPS.

(6) MAY BE ASSIGNED TO CORPS HEADQUARTERS OR COSCOM.

NOTE: WHEN PERFORMING COMBAT SERVICE SUPPORT MISSIONS, COMBAT SUPPORT UNITS MAY BE ATTACHED TO EITHER CORPS HEADQUARTERS OR COSCOM, DEPENDING ON MISSION REQUIREMENTS AND OTHER CONSIDERATIONS.

Figure 9. Type Corps support command (COSCOM).

- Simultaneous direction of current tactical operations, operational planning for the the future, and long-term force support tasks.

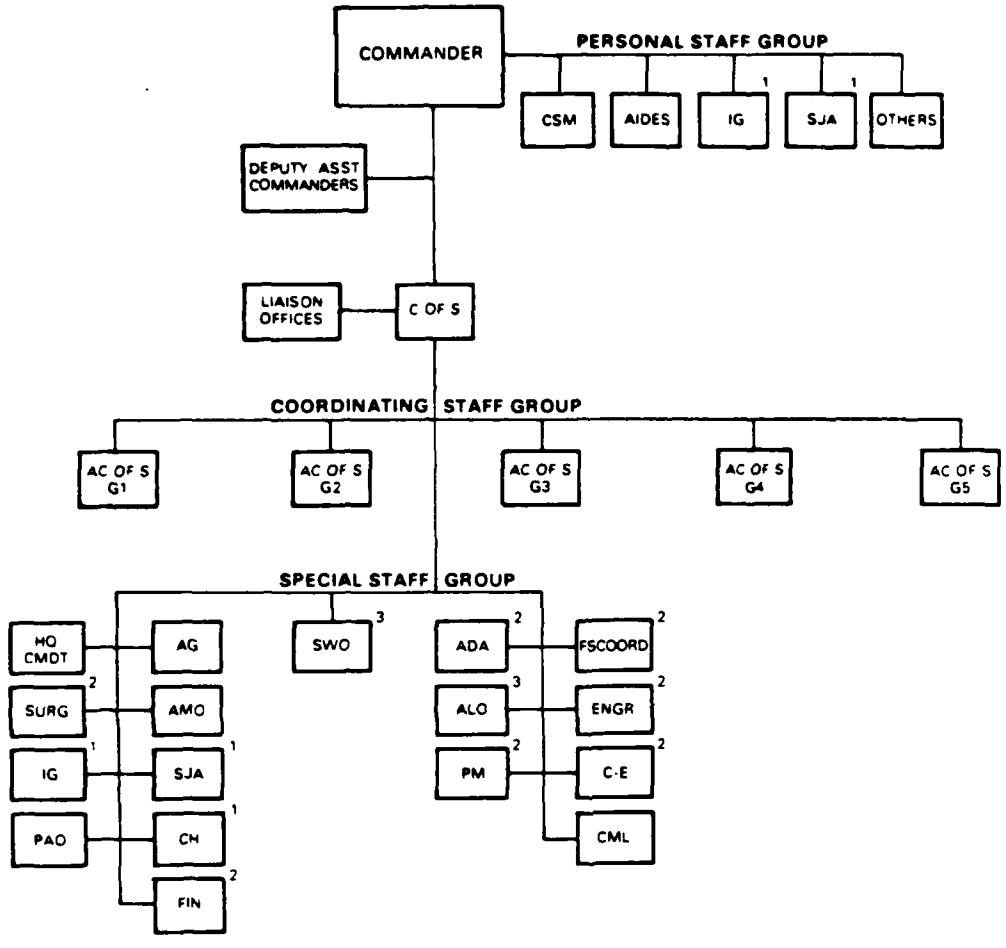
- Effective liaison with other services, allied allied forces, and adjacent corps.

Figure 10 provides a sample corps staff structure. The principal functions of the coordinating staff elements (G1-G5) are given in Table 3 and correspond to those of the division staff with, however, a significant increase in effort required due to the vast difference in size of the organizations. The staff has critical functions of not only informing the commander of corps activities and making recommendations, but also interacting between the staff elements for coordination of overall corps operations.

1.4.3.3 Command Post Operations -

While the basic structure of the corps staff is not altered in combat operations , it is necessary to organize command posts for effective command and control of the corps in battle. Because command posts (CPs) are centers for command and control, they are lucrative targets for enemy attack. This fact, together with the necessity to act quickly in battle, makes it imperative that CPs be kept as small and mobile as possible. The corps headquarters is normally divided into three command posts: the main CP, which is concerned with sustaining current operations and planning for future operations; the tactical CP (TAC CP), which exercises direct command and control of current combat operations; and the rear CP, where personnel service support and logistics operations are directed.

Figures 11 through 13 provide schematics of the three command post elements as defined by the "Corps Training Simulation Requirement Document" (Final Version), Battle Simulation Directorate, CGSC, August 1983. These figures are representative of a type organization which will be modified by each commander in response to the existing situation.



1 DIRECT ACCESS TO THE COMMANDER AS A PERSONAL STAFF OFFICER AS REQUIRED THE IG AND THE SJA, BY REGULATION (AR 20-1 AND AR 27-1), WILL BE MEMBERS OF THE PERSONAL STAFF GROUP

2 ALSO SUBORDINATE UNIT COMMANDER

3 PROVIDED BY US AIR FORCES

NOTE SPECIAL STAFF SECTIONS HAVE BEEN GROUPED UNDER THE COORDINATING STAFF SECTION RESPONSIBLE FOR PRIMARY STAFF COORDINATION

Figure 10. Corps staff structure.

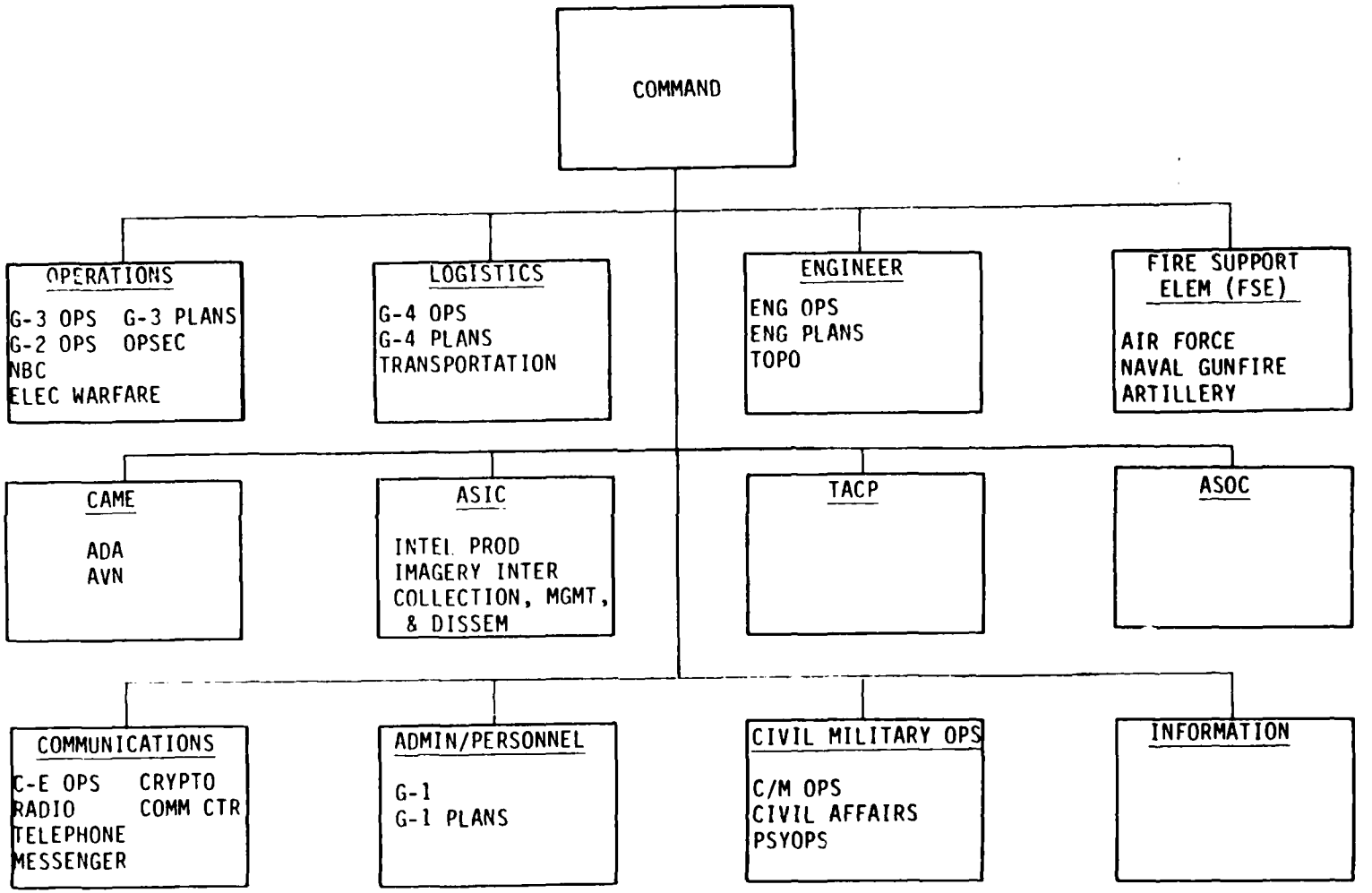


Figure 11. Corps main command post.

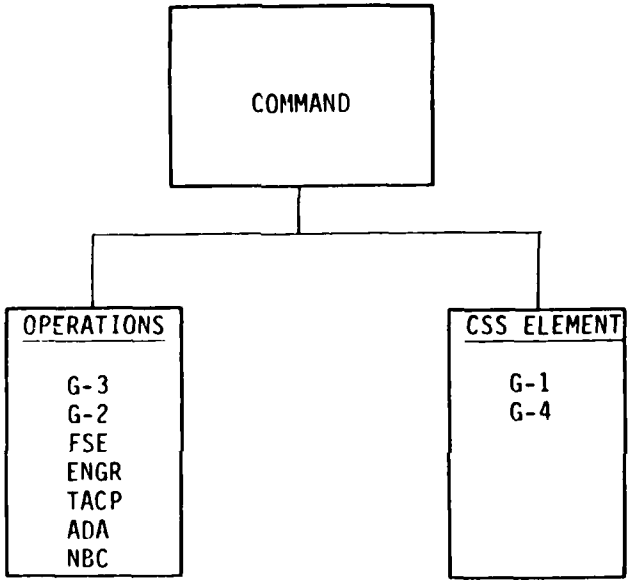


Figure 12. Corps tactical (TAC) command post.

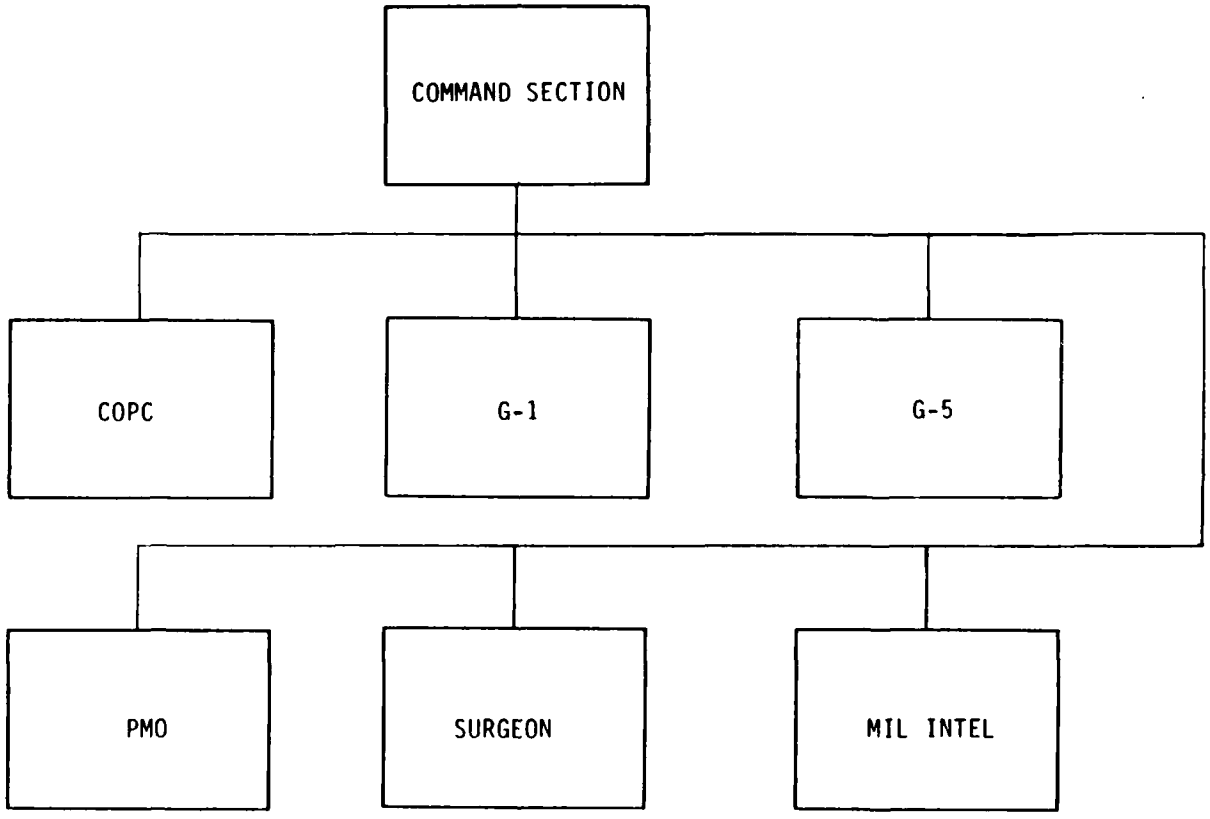


Figure 13. Corps rear command post.

SECTION 2

DIVISION/CORPS TRAINING SIMULATION REQUIREMENTS

2.1 NEED FOR A DIVISION/CORPS TRAINING SIMULATION

The division/corps command groups are very large management organizations which, in peacetime, are denied the opportunity to perform their ultimate management function; the management of forces in combat. The day-to-day peacetime operation of the division/corps is managed much like any large business organization. The management of forces in combat is quite different. Combat is intermittent and made up of many unique situations and, whereas the day-to-day operation has few emergencies, the combat operation consists of many emergencies. The mobility of modern warfare has created an extremely dynamic situation to be managed. The planning horizon for a division in combat is only 24 hours; for a corps, only 72 hours. This is in contrast to a one to five year planning horizon for comparable industrial organizations. Time is critical in the management of combat operations. Decision information must be obtained, processed, and evaluated very rapidly. In organizations of this size, information and data must be correlated and coordinated with many other elements to insure that all relevant data are considered and that all data considered are relevant. The penalties for bad decisions are extremely severe in combat.

The stress created by the potential penalties and the severe time constraints create a unique management situation which cannot be readily taught or learned except through practice. Active practice of what is to be learned has been shown to be one of the most effective means of learning. Active practice means doing those behaviors to be learned and receiving quick feedback on the results of those behaviors -- not just reading or thinking about them.

The field training exercise (FTX) provides the most realistic simulation of a combat situation. It puts

troops and equipment in the field with problems and emergencies (real or simulated) and thus duplicates the need for many of the combat management decisions. These exercises are, however, extremely expensive. The command post exercise (CPX) is an attempt to reduce this cost by reducing or eliminating the actual field deployment and simulating, through some means, the field situation and information flow to the headquarters. This also reduces the real-life, but unexpected, problems occurring in an exercise and, therefore, the training benefit for the management of resources in combat.

In actual combat, command groups/staffs receive reports from subordinate, adjacent, and higher units. These reports provide to the commander and his staff a representation of events occurring on the battlefield. The information contained in these reports does not reflect absolute or "ground" truth associated with a particular tactical situation. It is fragmentary and is degraded by a multitude of factors such as communications delays/breakdowns, human processing/interpretation errors, actions by the enemy to deceive or conceal, and overabundance of information. Thus, commanders and staffs must develop a picture of the tactical situation through incomplete and imperfect reports of events and outcomes. It is the information processing nature of command and control which makes battle simulations applicable, in general, to the command and control (C2) training environment. Battle simulations replicate the actions of maneuver and supporting systems through manual play or through computers. As in actual combat or field exercise conditions, battle simulations provide representations of events which are reported to the command/staff group (trainees). From the standpoint of the staff, the reports are (ideally) indistinguishable from the reports generated during actual combat. Thus, in general, the C2 training benefits that a command/staff group will obtain from participation in an exercise using a battle simulation are expected to be high. Battle simulations cause command groups to exercise the interpersonal interactions which are often the focus of training objectives. Battle simulations provide the trainees with active practice in the behaviors they are to learn. The realities of today and the projections for tomorrow dictate that the managers, as well as the combat soldiers, must be well practiced and ready immediately when they are required. A training system which provides a realistic simulation of the combat environment will provide the means to accomplish this practice and increase the combat readiness of division and corps command groups.

A training simulation system is, however, much more than an information provider to drive a CPX. A training simulation system must provide for feedback, both

positive and negative, to the trainees. Good performance should be acknowledged to reinforce the learning of proper methods. Poor performance should be pointed out along with measures required to improve performance. This feedback to the trainees should take place, ideally, immediately following the evaluated performance. In a training exercise involving a large, interacting group such as division or corps staff this is not practical. In this situation, the most appropriate means would be to periodically halt the training and review past performance with groups or individual trainees. In order to accomplish this, the simulation must be capable of being stopped and then restarted. For purposes of the review, selected segments of the exercise must be able to be recalled and played back, thus partially compensating for the inability to provide immediate feedback to the trainees by replaying the event.

As noted above, the division/corps command groups need a more cost-effective means than the FTX and a more effective training means than the CPX to accomplish battle management training. Chapter 1 provided a brief description of these organizations and outlined the subordinate elements controlled and coordinated by the staff. Figures 1-4 thru 1-6 and 1-10 thru 1-12 provided block diagrams of type command posts operated by these staffs. These block diagrams are intended to represent all personnel expected to operate within a particular staff element in a combat situation and; therefore, identify the trainees for the training simulation system.

An effective commander must utilize his staff. The principal coordinating staff officer must rely on his action officers to effectively assist the commander, and the action officers cannot function properly without the assigned noncommissioned officers and enlisted men; therefore, staff training must include the entire staff. A training simulation is needed to insure that division/ corps command groups can make a smooth and efficient transition from peacetime to wartime operations and to reduce the costs of attaining and maintaining this capability. A division/corps training simulation can meet this need by creating an environment which simulates combat conditions and provides for the cost-effective exercise and practice of the resource management functions and decision making processes required in this environment.

2.2 CONCEPT FOR DIVISION/CORPS COMMAND GROUP TRAINING

Division/corps commanders and their staffs suffer from the lack of an acceptable system by which they may

effectively train for and practice military force and resource management under simulated combat conditions. A training objective has been established by the Army to support the training of division/corps commanders and their battle staffs by providing a wide range of realistic decision making experiences on the simulated AirLand Battlefield. This paragraph offers a training concept to achieve the objective and to guide the design and development of a computer-assisted, man-in-the-loop training simulation. In general terms and under simulated combat conditions, the division/corps training simulation must accomplish the following:

- Train the commander and his battle staff in combat decision making, with particular emphasis on command and control of assigned forces and resources.

- Support the exercise and the enhancement of decision making procedures, staff techniques, and command post procedures.

- Support the development, introduction, and training on new concepts, doctrine, and tactics.

- Support the exercise of command, control, and communications equipment, procedures, and doctrine.

- Support the timely evaluation of the state of training of the commander and his staff.

2.2.1 Definition

The term training simulation is used in its broadest context and is defined as consisting of:

- The training audience (division/corps commanders and their battle staffs)

- The facilities, garrison or field, in which the training will be conducted.

- The supporting communication systems.

- The administrative staff necessary to support the division/corps command groups in the field.

- Fully documented standing operating procedures, communications-electronics operating instructions, and similar procedures and instructions essential to effective C2.

- Automation systems which may both assist in command and control as well as support the training through simulation of combat, combat support, and combat service support operations.

- The staff necessary to control and evaluate the training as well as to interface with the automated battle simulation systems.

2.2.2 Training Simulation Scope

The training simulation will be developed and exercised to require the division/corps commanders and staffs to both plan and fight the battle as well as to sustain the forces during the battle. To achieve these objectives, each commander and his battle staff must be able to:

- Accurately visualize and interpret the battlefield.

- Control and coordinate the division/corps forces and resources in order to bring maximum combat power to bear at the decisive time and place.

- Maximize the probability of successful mission accomplishment while minimizing friendly casualties.

- Control and coordinate command group activities without confusion.

The training simulation is similar to the traditional command post exercise (CPX), which is a field exercise for command, staff, headquarters, and communications personnel at all levels. In a CPX all friendly troops (other than headquarters and communication units), as well as enemy units, are normally represented by umpires/controllers, and such exercises permit commanders and staffs to apply their command and staff procedures in a wide variety of tactical situations.

The division/corps training simulation differs from the normal CPX in that interfacing commanders and their staffs (higher, adjacent, and supporting as well as subordinate) are represented by the controller staff, and the battle simulation is automated so as to provide the participating commanders and their staffs with realistic and continuing battle situations and outcomes. The scope of training using automation, including a division/corps battle simulation model, enhances significantly the play and training benefit over a standard CPX by:

- Permitting more expansive and interactive commander and staff participation in real time.

- Simulating actual force interactions and other activities and calculating battle outcome for feedback to players.

- Permitting reiterative scenario play for training purposes.

- Reducing the time and effort to produce scenarios and eliminating the need for master incident lists.

- Reducing in size while more efficiently utilizing the controller staff.

- Providing more realistic and rewarding exercise play and training benefit at reduced costs.

The training simulation will support modular training of the elements of the division/corps command groups; i.e., the entire training audience (commanders and battle staffs) may be involved simultaneously, or staff functional elements of the coordinating staff group (general staff) may be exercised and trained singly or in combination. Alternative consideration may be given to training of the command group by geographical location (i.e., tactical, main, and rear command posts); however, this alternative may demand role playing and simulation capabilities which are considerably more complicated. Under the concept, the training simulation will not support the training independently of branches and sections internal to the coordinating staff groups nor of a single special staff group.

The training simulation will support the training of commanders and battle staffs at either division or corps levels. Alternatively the training simulation will accommodate the training of the corps command group and one or more division command groups in an integrated, concurrent training scenario. In this context the training simulation will be sufficiently realistic to train commanders and battle staffs in the staff planning and procedures for implementation of any specific division/corps contingency plan or other selected real life scenario; however, the training simulation is not intended to evaluate the quality of a contingency plan nor to be used to accurately predict battle outcome based upon implementation of the contingency plan.

The division/corps training simulation system will require an extended period of up to six years for design, development, and implementation. The concept recognizes that a short term (approximately two years) training simulation is desirable, practicable, and possible. Such a short term system may best be achieved by concentrating on division training simulation development while in the longer term extending the simulation capability to accommodate the concurrent and integrated division/corps staff training requirement.

2.2.3 Detailed Concept

The training simulation scope discussed above is expanded in this subparagraph in order to provide a more detailed understanding of the concept.

The concept for the combined division and corps training simulation is displayed in Figure 14. The training audience in this instance consists of one division commander and the corps commander plus their respective battle staffs (Figures 5 through 7 and Figures 11 through 13 respectively). The division/corps command groups may be trained independently or concurrently using the training simulation and the appropriate controller staff; however, concurrent training must be conducted using a single, integrated tactical scenario involving the corps and the division. All headquarters external to the training audience will be represented by controllers and the battle simulation model. When the division and corps command groups are being trained concurrently , dual roles are required of many of the controller elements; for example, a division controller (or controller team) may be required to perform as the staff both of a subordinate element of the corps and of a division adjacent to the participating division. The organizational level of unit play in the division/corps training simulation will be the maneuver battalion; however, some automation of brigade level and higher functions may be desirable when the training simulation is played only at corps level.

The concept for training within either the division or the corps command group is exemplified in Figure 15. The key components are the training audience (division or corps command group), the controller staff, the training facilities and supporting communications, and the division/corps training simulation model. Figure 15 shows the entire division (or corps) staff receiving training concurrently; however, the training may be reduced to a single general staff section (Figure 16) wherein other general staff sections are played by the controller staff. In the training simulation exercises, the training audience (commanders and battle staffs) may play from a single location or may be distributed by staff function among the tactical, main, or rear command posts as dictated by the division/corps standing operating procedures or as desired by the commander. Groups of players by command post location and/or general staff section (Figure 17) may be trained concurrently using the training simulation. In such cases, the controller staff would be called upon for appropriate interfaces with each command post location. In some cases, the command group elements in the tactical CP (commander, G2 elements, and G3 elements) combined

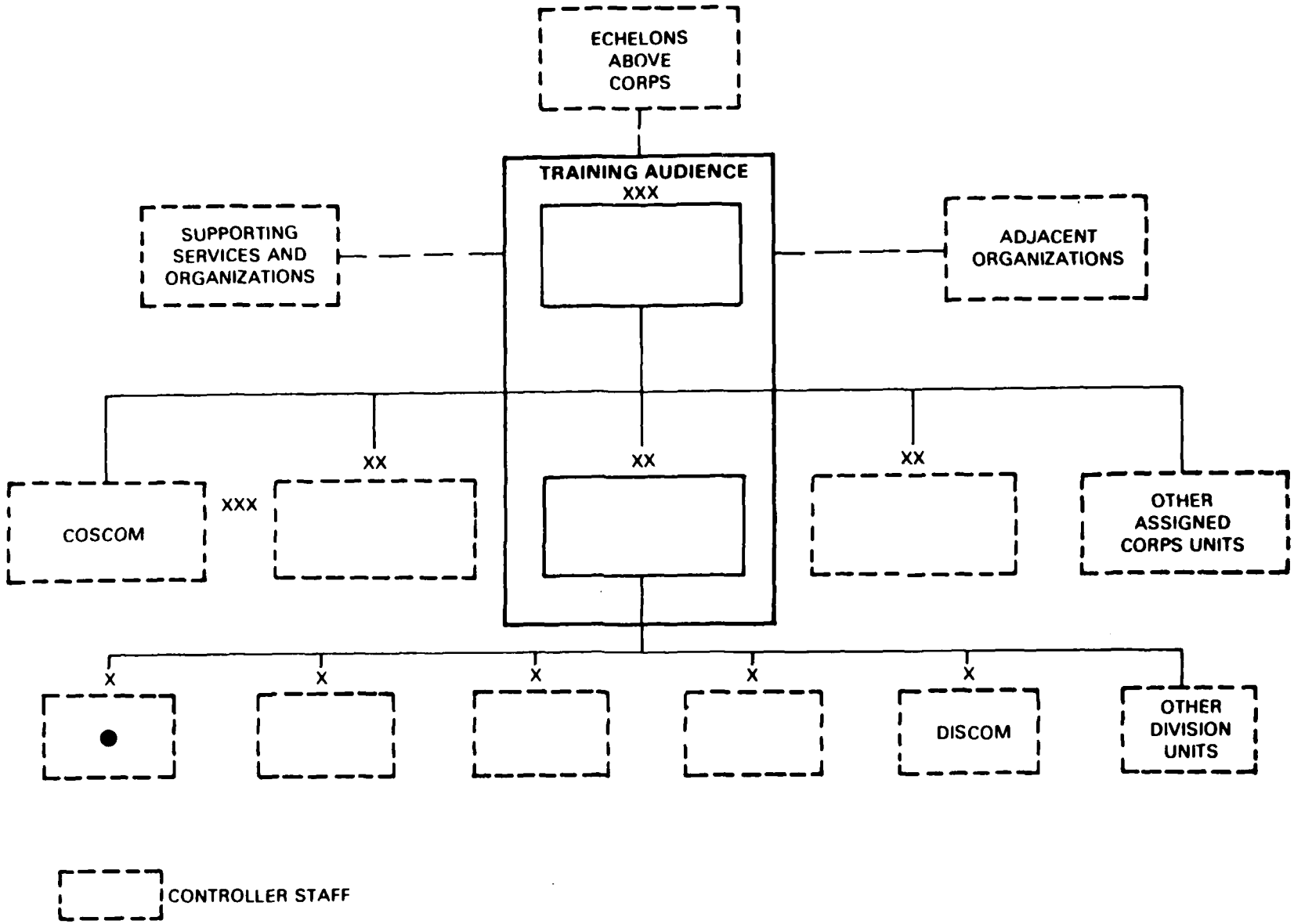


Figure 14. Combined division/Corps training concept.

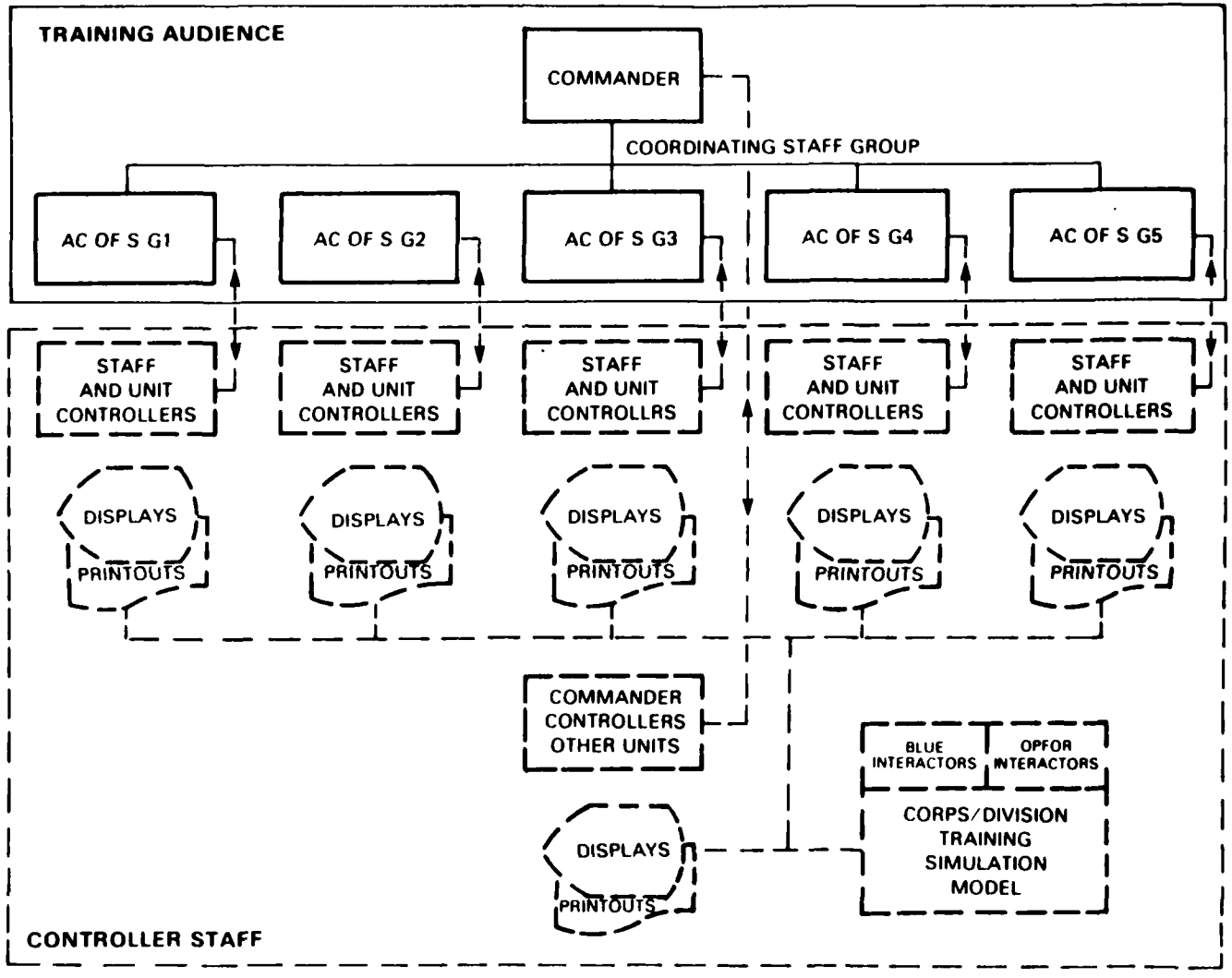


Figure 15. Training simulation concept for command group.

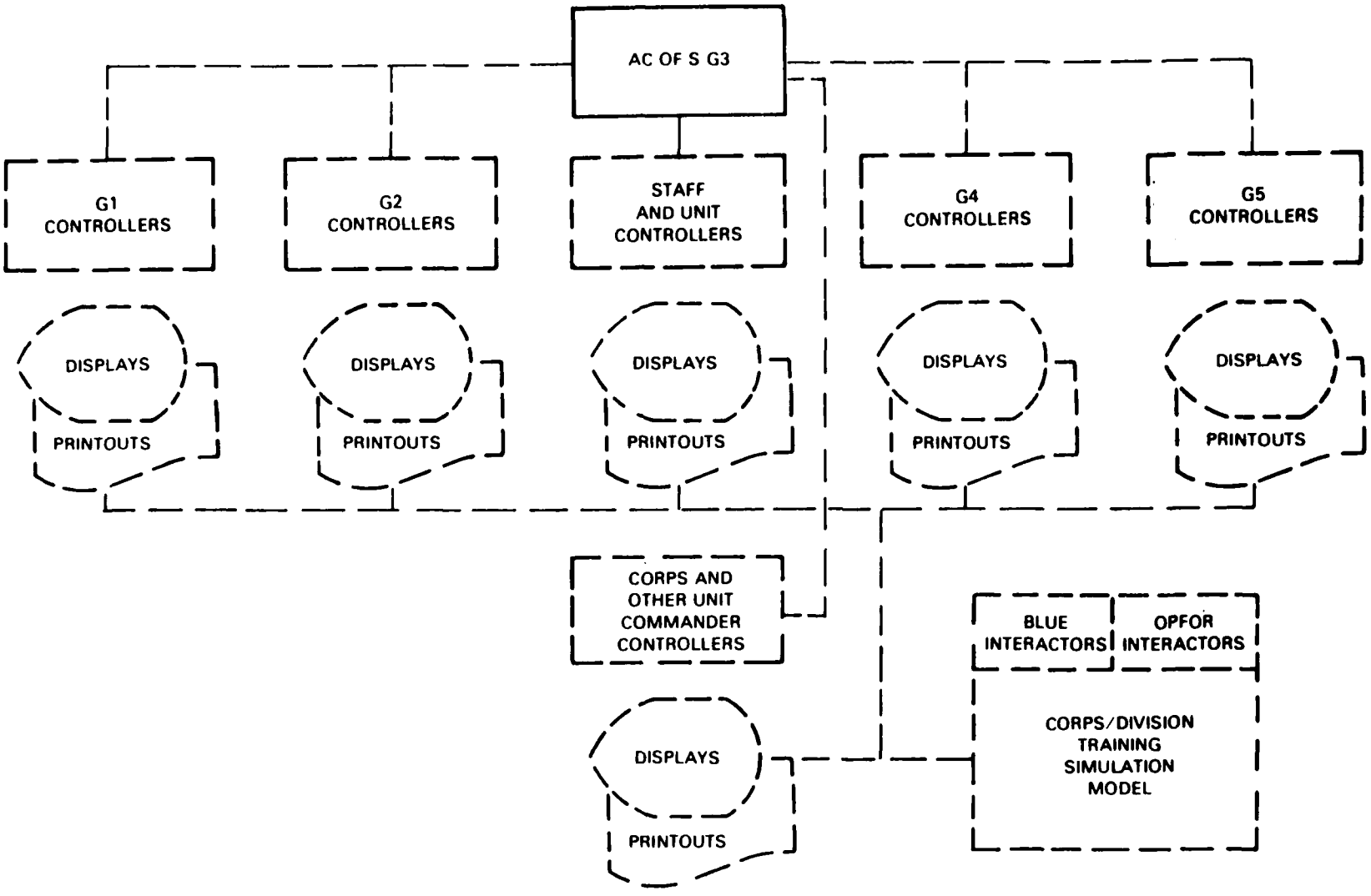


Figure 16. Training simulation concept for AC of S G3.

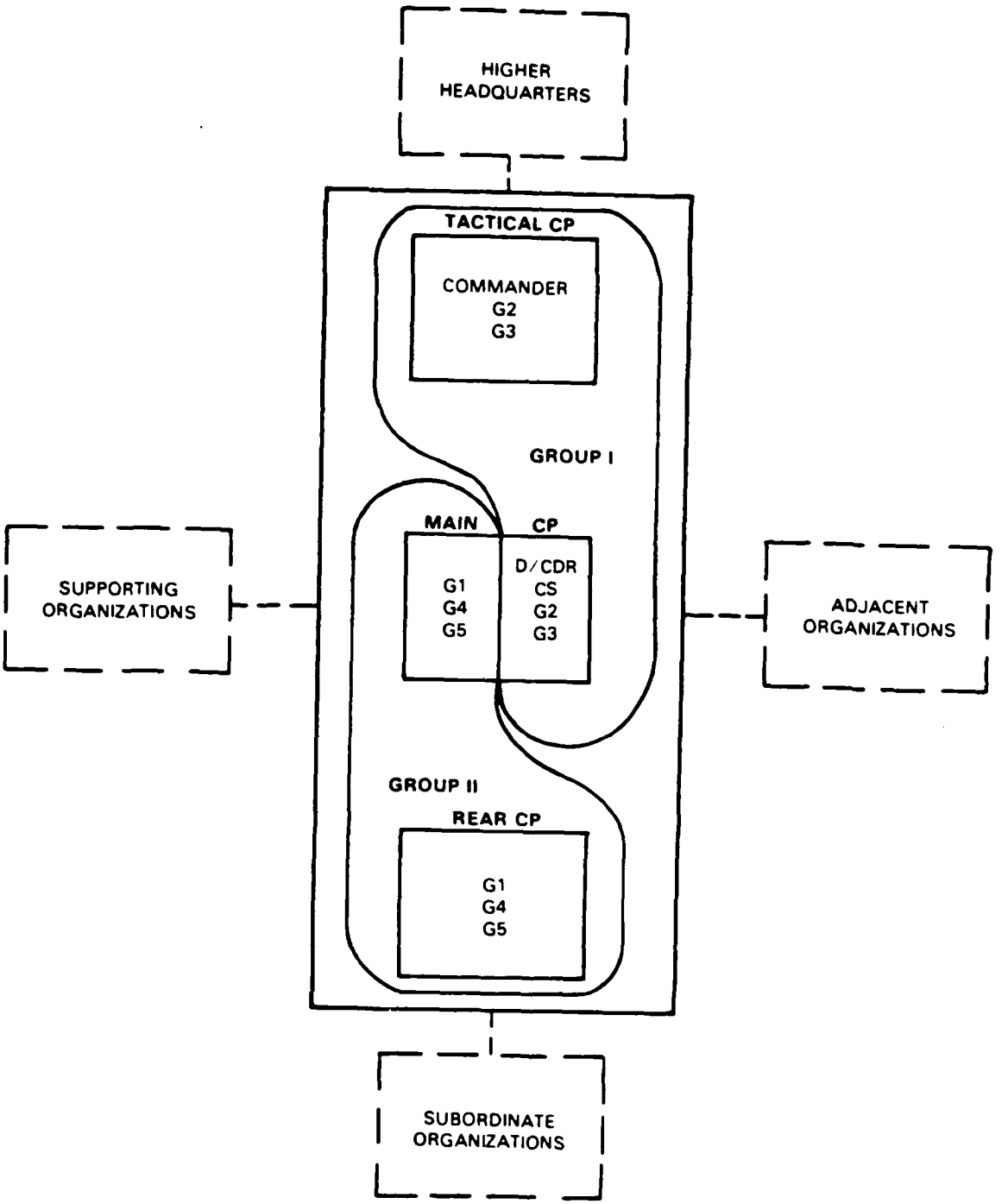


Figure 17. Training by echelonment of command post.

with elements in the main CP (deputy commander, chief of staff, G2 elements, and G3 elements) may be the principal training audience in a purely operational scenario (Group I in Figure 17). On the other hand, a separate training audience for administrative/logistical play may include the G1/G4/G5 elements in the main CP and the corresponding staff elements in the rear CP (Group II in Figure 17). In each case, the controller staff would play the nonrepresented general staff sections as well as all staffs and organizations external to the training audience. Realistic communications (simulated or real) must be available between the various command posts and the higher, adjacent, supporting, and subordinate organizations (the latter being represented by the controller staff).

2.2.4 Key Concept Parameters

In order to avoid the extensive commitment of forces, resources, and time to division/corps command group training, yet optimize the desired training effort, the training simulation concept includes the parameters discussed in the following paragraphs.

2.2.4.1 Training Audience -

Using the training simulation, command group training should be conducted progressively from the bottom up; i.e., first, training the general staff sections independently; second, combining two or more general staff sections in a single exercise; and finally, integrating all general staff sections with commander participation into a fully functioning division or corps command group.

The same building block concept should be used in the application of the training simulation to the organization level of interest; namely, building and using the simulation to train the division command group before expanding the simulation to accommodate corps command group training. Such an approach has the advantage in development of the training simulation of building the training simulation model, data base, and all procedures in a methodical and progressive manner until the overall division/corps training simulation is achieved.

As the training simulation is applied, refinement of the training audience may be necessary, eliminating staff members who do not contribute significantly to achieve training objectives and adding those who do. Changes in the

training audience and/or the system configuration may also be necessary to reflect new procedures and/or doctrine for staff operations, e.g., dispersed CP's, automated staff assistance. The training audience should be balanced in composition so as to include key staff officers, action officers, and appropriate noncommissioned officers. Care must be exercised to ensure that the training audience participates correctly and fully in their TOE/TDA roles.

2.2.4.2 Availability -

In order to support the building block concept outlined above, the training system must be available to staffs on a frequent and regular basis. Due to the personnel turnover experience in the Army, it is felt that a minimum of two full staff exercises per year are required to realize a significant benefit from the system. In the intervening periods, the system must be available for use by individual staff sections and combinations of staff sections to refine their internal staff procedures and the coordination procedures required between staff sections.

The alternatives for fielding such a system range from the development and acquisition of a highly transportable single system which can be moved to the user's training site, through the acquisition of several systems for positioning in key geographical areas of the world, to the acquisition of a system for each division/corps in the Active Army troop list. Detailed cost-benefit analysis is required of the development, production, operating costs (both manpower and dollars), and the required/planned frequency of use in order to choose among these alternatives.

2.2.4.3 Training Facilities -

The facilities supporting the training simulation are of particular importance in the simulation concept. The cardinal rule to be followed is to separate the training audience from routine, day-to-day staff and command activities, thus permitting them to concentrate their undivided attention on training. Situations permitting, it is also highly desirable to separate the training audience from their domestic (family) activities for the same reason.

It is very resource demanding to displace a division or corps staff from garrison to a field location for the purpose of conducting either a training simulation or a command post exercise. For this reason, as well as a

variety of other reasons, initial training using the training simulation should be conducted in a garrison area set aside and equipped for such training. Not only is it more conducive to the type of training visualized, but the association of the training audience with the controller staff and the training simulation model will provide a greater assurance of achieving the training objectives sought.

Physical layout of the command posts for training simulation play should conform to standing operating procedures. To the extent practicable the command posts should be equipped with TOE items and with such other items as might constitute the "basic load" of command post equipment.

Echelons of the command post should be separated physically and should be interconnected with realistic communication capabilities. Travel times between command post echelons should be realistically imposed upon the training audience.

The goal should be to create an environment which realistically simulates and enhances the trainees perception of an actual combat operation.

2.2.4.4 Communications -

Communication nets and equipment normally available to and used by division and corps command groups should be reasonably simulated in the training simulation. Command post facilities established in field locations should be serviced by TOE communications support, both between CP's and with controllers. If a fixed training facility is established, the communications connections can be permanently established by wire but must appear to the training audience as the normally available means. Constraints on communications (ECM as well as normal outages and transmission constraints) should be realistically applied during the training exercises. Communications security by all elements of the training audience should be practiced and should be evaluated by the controller staff as well as by key participating staff officers. Tempest requirements of the entire system must be evaluated. Communications-electronics operating instructions (CEOI) should be promulgated, practiced, and enforced throughout the training simulation.

2.2.4.5 Administrative Support -

Administrative support of the training simulation exercise should be the minimum essential for effective training. Administrative support functions (i.e., messing, sleeping, CP displacement and dispersion, etc.) should be conducted nontactically to minimize costs and to maximize available resources.

Care should be taken so that the perception of a realistic combat environment is not greatly degraded.

2.2.4.6 Staff Procedures -

Documentation of the unit's organization and staff standing operating procedures (SOPs) should be available to controllers and should be adhered to during training simulation exercises. Adherence to such SOPs will promote understanding and teamwork between members of the command group and between the command group and subordinate units. Training simulation exercises will provide the forum for evaluating procedures by both the training audience and the controller staff and for revising the procedures to produce the most effective and coordinated command group performance. The training system must be flexible enough to accommodate differences in unit SOP's.

2.2.4.7 Training Scenarios -

One of the most challenging elements of the introduction and application of the division/corps training simulation is the development of the training scenarios. The training scenarios, appropriately constrained by security requirements, should be developed to portray realistic forces, resources, environments, enemy forces, and anticipated military operations. Additionally, the scenarios must be sufficiently detailed and complete to exercise realistically each element of the training audience; therefore, the scenario must include combat, combat support, and combat service support operations at both division and corps level. The detail of the scenarios, once developed, will provide the basis for input to the data base to be used by the training simulation model. The means for creating and updating the scenario data bases should be automation assisted and user friendly, to ensure rapid and accurate modifications for specific training purposes.

2.2.4.8 Controller Staff -

The controller staff must be of sufficient size and skill to represent realistically the staff and command functions essential for training simulation play. The controllers must be well organized and skillfully managed, and they must be trained in both realistic role playing and in the necessary interactions between the training audience and the training simulation model. Controllers will be supported by both manual and computer-driven information displays which will greatly facilitate their functional performance. In order to avoid the necessity of a large permanent controller staff, careful exercise planning and the use of simple information displays and inputs formats for controller interaction with the siumlation, will allow the integration of qualified personnel from field organizations into the controller staff.

2.2.4.9 Training Simulation Model -

At the heart of the division/corps training simulation is the computerized training simulation model. The model and submodels must be capable of simulating interactively a complete range of combat, combat support, and combat service support operations at a sufficient level of detail to permit a realistic exercise of division/corps command groups. It is anticipated that the level of play in the simulation will be at maneuver battalion and comparable levels for friendly forces and at regimental level for OPFOR units. The models must be capable of accepting plans and commands of the division/corps command groups and controller staff, playing these plans and commands in the models to determine the effect they may have on the battle, and outputting results in a form useful to the controllers and/or training audience. The computer which hosts the combat models will also accommodate software which will collect data for feedback to the training audience, as well as for analysis and evaluation of training.

Data bases in keeping with the various scenarios are anticipated to be extensive in order to accommodate the variety of division/corps organizations, environments, and missions. Models must output to files and data bases periodically the status and rates of change of enemy forces as well as friendly forces; dynamic information of the environment (including weather and terrain) must be continuously available; and command guidance, rules of engagement, and priorities must be updated and accessible. A variety of files containing normally available information

will be existent and available for controller role playing. A fully capable data base management system is essential.

2.3 FUNCTIONAL REPRESENTATIONS

Functional Area Model Outlines are documented in "Corps Training Simulation Requirements Document" (Final Version), Battle Simulations Directorate, CGSC. The outlines are categorized by functional area and subfunctional areas as follows:

- Force Control
  - Command and Control (C2)
  - Communications
- Maneuver Forces
  - Movement
  - Maneuver
  - Conflict
  - Reconnaissance
  - Security Operations
- Fire Support
  - Field Artillery
  - Close Air Support
  - Naval Gunfire
  - Target Acquisition
- Combat Electronic Warfare and Intelligence (CEWI)
  - Integrated Intelligence
  - Electronic Warfare
  - Operations Security Support
- Air Defense
  - Air Battle Management
  - Airspace Management
- Combat Service Support
  - Transportation
  - Maintenance
  - Field Service
  - Supply
  - Medical
  - Personnel Replacement
- Engineer
  - Mobility
  - Survivability
  - General Engineering

The primary function of the divison/corps training simulation is to provide information to the commander and his staff so that a perception of the battle can be formed in order to make decisions or recommendations for the allocation of resources to accomplish the mission. The

simulation must be able to receive and respond to those decisions and provide additional information to the commander and staff which reflects the effects of those decisions and leads to other decisions. The information needs of the command group (trainees) must be defined in order to identify the modeling requirements for providing it and for accepting the decision guidance/direction and responding to it.

2.4 INFORMATION NEEDS AND INTERFACES

The first step in design of the training system must be to define the information and data required by the command group in the performance of its functions. The command group which is training must be furnished this information and data in a realistic manner. This means that human contact is required with subordinate, adjacent, and higher headquarters. The information flow analysis will identify where and how much human interaction is required. It will identify the information requirements of controller personnel, both from the simulation and from the trainee staff back into the simulation. This analysis is required to define the input and output requirements of the simulation and the controller requirements of the training system.

As an initial attempt to define the information interfaces, the "Phase 1, Corps Information Flow (CIF) Study, CACDA, April, 1979, was examined. That study defined 38 information needs of the corps commander. The study made no attempt to define the information needs of the staff. The flow of information to the commander through the staff was detailed for the 38 items. The coordination and feedback of information or the flow of information items to other concerned staff elements was not addressed. The study provides only a limited start toward defining the information flow and interface requirement for a corps training simulation.

The Force Level Information Requirements Plan (FLIRP), prepared under the auspices of the Command and Control Subordinate Systems (CCSS), was identified as an additional source for analysis of information requirements. That plan identified 85 information units (several of which are redundant) and the subunits which make up each. It provides a much more detailed definition than the CIF of the information required but does not contain a flow analysis of that information.

The "Corps Training Simulation Requirements Document" and the "Division Training Simulation Requirements Document," Battle Simulations Directorate, CGSC, define the tasks to be accomplished by various staff elements, the information requirements of the task, and the source of the information. Additionally, the "Division Information Flow Study," Appendix H, CACDA was examined to determine the information requirements of the division command and staff.

Table 4 provides a listing of information items compiled from the above analysis. Each information item consists of several data elements. The information items are generally very broad with specifics defined by the data elements. Presently, even the data elements are broad in definition and require further refinement as to level of detail (unit of measure) and frequency. Data elements of any information item may come from a variety of sources and are intended to represent either request or response as determined by the information interface. The 57 information items and the 284 data elements of Table 4 represent the information requirements of both division/corps command groups. Differences between the two organizational levels will be found primarily in the level of detail (unit of measure) and in frequency requirements.

An examination and comparison of Figures 5 thru 7 with Figures 11 thru 13 shows minor differences between division and corps in the organization of the various CP's. It should be noted that the organizations shown are only representative. No particular command group can be expected to operate in exactly the configuration shown; however, changes in CP organization have little effect on the information needs of each staff section. The primary effect is a change of communication channel required for the majority of that information flow.

The information items listed in Table 4 were used to define, by means of N^2 charts, the information interfaces required for the proper flow of information. The N^2 charts are furnished in Appendix A along with a listing of the information item transfers for each "From-To" pair identified in the analysis.

The primary purpose of this analysis is to identify the input/output requirements of the simulation and provide a preliminary definition of the controller requirements for handling this input/output and interfacing with the division/corps command group.

The required external interfaces define information which must be furnished by the simulation

system, either directly from the computer or through a controller, to the players (trainees). Table 5 provides a listing of the external agencies with which information exchange is required.

The simulation must provide information to the controller personnel to allow them to portray specific organizations, make the required reports, and furnish information requested by the trainee staff. Conversely, the simulation must accept input from the controller personnel reflecting the decisions and guidance of the trainee staff. As noted above, all interfaces with the trainees should appear as normal communications with the simulated organization or activity. Certain forms of message traffic may be able to be handled directly by the computer, but many of the interfaces will require the human interface to interpret orders and to simply provide the required interpersonal relations. The agencies listed in Table 5 do not represent a count of controller requirements. A single controller may be able to represent several of these agencies. Some will require multiple controllers. For example, the Brigade/Division will likely require at least one controller per brigade in a division training exercise. In a corps training exercise multiple controllers will be required to represent each simulated division.

Table 6 provides a listing of the information items required to be passed between elements of the trainee staff and external agencies. Table 5 provides a key to the abbreviation used in Table 6. (Attachment for a description of the derivation. Table 6 is an extract from Table 16.) Table 6 shows each identified "From-To" pair for information exchange into and out of the trainee staff thereby providing a means for an initial estimate of controller loading. These transfers require further detailed analysis to identify specific data elements, units of measure, timing, and format of information interchange. This analysis will be required for the design specification of the training system.

Initial estimates for controller station hardware were made from this analysis. Estimates of numbers of controller personnel required are much harder to make. Most controller stations will probably require multiple personnel simply to satisfy the requirement for personnel interaction with the trainee staff. The command groups which are to be trained are large management organizations which generally perform a large part of their external coordination by telephone. Realistic training requires that the training system be capable of supporting this practice. This will require a large number of controller personnel to provide the human interaction.

Table 4. Staff information needs.

a. Terrain

1. Major Road Networks
2. Major Bridges (Bridging Requirements)
3. Major Terrain Obstacles (Mountains, Forests, Water)
4. Trafficability
5. Cover and Concealment
6. Width, Length, and Directness
7. Critical Terrain

b. Weather

1. Time
2. Area
3. Current Conditions
4. Forecast Conditions

c. Location of Enemy 1st Echelon (Regiments and Divisions)

1. Location of Units in Contact
2. Location of Regimental/Divisional Artillery Groups
3. Concentrations of Command and Control Related Equipment
4. Composition of Concentrations
5. Location of Regimental/Divisional ADA System
6. Location of Regimental/Divisional Rear Services
7. Weapons: Type and Count

d. Location of Enemy 2d Echelon (Divisions, Armies and Army Fronts)

1. Mass and Movement 20 - 300 km
2. Assembly Area Locations
3. Army ADA Weapon Locations
4. Communications Locations

Table 4. Staff information needs (continued).

e. Major Enemy Concentrations Out to Approximately 300km from FEBA

1. Major Railhead and Airhead Locations
2. Concentration of Maintenance Equipment and Repair Facilities
3. Location of Communications Nodes
4. Location of Logistics Depots
5. Convergence of MSRs
6. Location of ADA Protection

f. Location and Composition of Enemy Nuclear-Capable Units

1. Nuclear Storage Site Locations
2. Alert Communications
3. Disposition
4. Type of Delivery System
5. Movements of Weapons from Storage to Site

g. Significant Enemy Activities

1. Activity
2. Time of Activity
3. Location
4. Unit ID

h. Current and Projected Status of Roads, Bridges, Railways, Urban Areas, Pipelines, and Airports (Times, Locations, Capacities, etc.)

1. Roads
2. Railways
3. Urban Areas
4. Pipelines
5. Bridges (Existing, Destroyed, Engineer Installed)
6. Airports
7. Ferry Operations

Table 4. Staff information needs (continued).

i. Probable Enemy Courses of Action (G2/S2 Assessment)

1. Location
2. Current Activities
3. Probable Future Action
4. Vulnerabilities

j. ADA Priorities

1. Location and Type of Asset Requiring Defense
2. Priority for Defense of Assets
3. ADA Unit Assignment for Asset Defense

k. ADA Unit Status/Coverage

1. Unit Location
2. AD System Status (Auth/On-hand/Operational)
3. Ammunition/Missile Status (Basic Load/On-hand)
4. Area of Coverage (Coordinates)
5. Sightings, Engagements, Kills

l. Artillery Status (FA, Naval Gun, etc.)

1. Unit Designation
2. Location
3. Weapon Status (Auth/On-hand/Operational)
4. Ammunition Status (Basic Load/On-hand)
5. Mission Assignment (DS, R, GSR, GS)

m. Force Ratios

1. Friendly Unit Direct Fire, Antitank Systems
2. Estimate of Enemy Direct Fire, Antitank Systems

Table 4. Staff information needs (continued).

n. Major Critical/Serious Incidents

1. Who, What, When, Where, Why, Effect, Remarks

o. Unit Locations and Status (MSC's, Cbt, CS, and Sep Bn's, Adjacent & Supporting Units)

1. Unit ID
2. Location
3. Weapon/Equipment Status (Auth/On-hand/Operational)
4. Personnel Status (Auth/Present for Duty)

p. Unit Activity and Commander Assessment

1. Activity Level (Situation)
2. Unit Status
3. Mission Readiness
4. Reasons for Low Readiness
5. Commander's Evaluation

q. Task Organization for Combat (Corps, Division, and Brigade Units Organized for Combat)

1. Task Force HQ
2. Subordinate Units

r. Communications Status

1. Unable to Contact Subordinate Unit for Past 30 Minutes (HF/FM)
2. Multichannel Outage 10 Minutes
3. Switchboard Outage
4. Flash - Immediate Message Delays
5. Loss/Destruction of Major Comm Equipments
6. Enemy EW Activity

Table 4. Staff information needs (continued).

s. Assets Available (Critical/Command Controlled Materiel)

1. Unit ID
2. Asset ID
3. Authorized Quantity
4. On-hand Quantity
5. Operational Status
6. Location of Asset

t. Critical Personnel by MOS

1. Unit ID
2. MOS/Grade
3. Authorized
4. Present for Duty
5. Losses
6. Expected Gains

u. Reserve/Uncommitted Force Status

1. Unit Identification
2. Location
3. Weapon/Equipment Status (Auth/On-hand/Operational)
4. Personnel Status (Auth/Present for Duty)
5. Projected Availability of Uncommitted Units

v. A/C Requirements/Projections

1. Mission Type (CAS, Recon, Interdiction, Lift/Air Evac)
2. Required Time
3. Required Load (Ordnance, Sensors, Cargo, Etc.)
4. Target Type and Location
5. Projected Availability

Table 4. Staff information needs (continued).

w. A/C Approved Allocations/Priorities

1. A/C Mission
2. Effective Time
3. A/C Number & Type
4. Ordnance/Cargo
5. Controlling Unit
6. Priority of Mission

x. A/C Sorties Expended/Remaining

1. Sortie Allocation
2. Missions Completed/Aborted/Reallocated
3. Mission Results
4. Sorties Remaining/Type/Priority

y. Airspace Restrictions

1. Restricted Area Location
2. Effective time
3. Airspeed/Altitude/Heading Restrictions

z. Enemy Air Defense Suppression Requirements (SEAD)

1. Location of EAD System
2. Type EAD
3. Number of EAD Systems
4. Priority for Suppression

aa. Equipment Losses

1. Unit ID
2. Effective Time
3. Item Loss ID
4. Quantity of Loss
5. Type of Loss (Destroyed, Captured, Damaged-Repairable, Damaged-Non-repairable)

Table 4. Staff information needs (continued).

ab. Personnel Losses

1. Unit ID
2. Effective Time
3. Loss by Category - KIA, WIA, MIA, DNBI
4. MOS/Grade of Casualties
5. Total Casualties

ac. Medical Status

1. Patient Status & Numbers (US, Allied, PW, Civilian)
2. Admissions/Releases
3. Evacuations
4. Deceased
5. Beds Available
6. Class VIII Status
7. Blood Status/Requirements
8. Facility Locations
9. Planned Facility Moves
10. Significant Events/Changes

ad. OPORD/FRAG OPORD/PLAN

1. Mission (Objective, Location, Time, Unit)
2. Concept (Scheme of Maneuver)
3. Continuity of Operations (CONOPS) (Function, Primary, Alternate)
4. Constraints (Restriction, Time, Affected Item/Element)
5. Coordinating Instructions (Who, Instruction, Time, Location)

ae. Battlefield Control (Locations, Effective Times)

1. Boundaries
2. Area of Operations
3. Axis of Advance
4. Avenues of Approach
5. Coordinated Fire Line (CFL)
6. Front Line of Own Troops (FLOT)
7. Free Fire Area
8. Fire Support Coordination Line (FSCL)
9. Restricted Fire Line/Restrictive Fire Area

Table 4. Staff information needs (continued).

af. Command/G2 Essential Elements of Information

1. EEI Category
2. Unit
3. Events
4. Locations
5. Times

ag. Command Controlled/Cricital Items

1. Controlled Item ID
2. Requirements for Release/Issue
3. Reporting Requirements

ah. Priority of Resupply

1. Item(s) of Supply Concerned
2. Unit Designation
3. Priority of Unit for Supply of (1)
4. Effective Times

ai. Personnel Replacement Priorities

1. Unit
2. MOS/Grade Authorized
3. Assignments
4. Effective Time
5. Projected Gains

aj. Priority of Support to Combat Elements

1. Unit Supported
2. Type of Support
3. Effective Time
4. Priority for Unit-Type Support

Table 4. Staff information needs (continued).

ak. Planned Targets & Priorities

1. Target Type
2. Target Location
3. Priority for Neutralization
4. Unit Assigned Neutralization Responsibility
5. Method of Target Neutralization

al. Minefields/Obstacles/Barriers

1. Effective Time
2. Type
3. Location (Dimensions)
4. Purpose
5. Minefield Markings
6. Minefield Name
7. Minefield Type
8. Lanes/Gaps/Density
9. Method of Delivery
10. Clearance Method
11. Unit A/O

am. Engineer Support Requirements

1. Requested Mission
2. Effective Time
3. Requesting Unit
4. Area/Unit Affected
5. Desired Results
6. Location Affected
7. Priority of Mission

Table 4. Staff information needs (continued).

an. Atomic Demolition Munition (ADM) Missions

1. Effective Time Requested
2. Not Later Than Time
3. Requesting Unit
4. Tasked Unit
5. Yield
6. Nuclear Mark
7. Number of ADM
8. Location
9. Desired Effects

ao. Supply Point Locations/Capabilities

1. Supply Point Designation/Class of Supply
2. Location
3. Type/Quantities On-hand
4. Customer Service Capabilities

ap. Transportation Status

1. Assets Available/Capabilities (Local, Line, & Handling)
2. Major Supply Route (MSR) Status
3. Class III Status
4. Class VII Status

aq. Movement Request/Routing

1. Moving Unit
2. Number of Vehicles/Serials
3. Start Time/Location
4. Check Point Location
5. Release Point Location
6. Projected Release Time

Table 4. Staff information needs (continued).

ar. Supply Status by Class

1. Available/On-hand Supplies
2. Projected Requirements/Authorizations
3. Projected Gains
4. Critical Item(s)/Class(es)

as. Maintenance Status

1. Item(s)/Quantities in Maintenance
2. Repair/Availability Estimates
3. Projected Status
4. Problem Areas

at. Ammunition Required Supply Rate (RSR)

1. Effective Time
2. Unit ID
3. Ordnance Type
4. Quantity/Rate of Ordnance Required

au. Ammunition Available/Controlled Supply Rate (CSR)

1. Effective Time
2. Type Ordnance
3. Quantity/Supply Rate

av. Adjacent/Friendly Situation/Activity

1. Effective Time
2. Unit ID
3. Location
4. Operational Status
5. Mission
6. Activity

Table 4. Staff information needs (continued).

aw. Critical Situation Alert

1. Reporting Unit/Affected Unit
2. Effective Time
3. Situation
4. Location

ax. Electronic Warfare Tasking

1. Requesting Unit
2. Mission Requested
3. Effective Time of Mission
4. Not Later Than Time
5. Target Type and Location
6. Desired Results

ay. Special Operations

1. Type of Operation
2. Location (Area) of Operation
3. Effective Time
4. Units Affected
5. Current Status of Operation

az. Strike Warning

1. Code Name
2. Target
3. Originating Unit
4. Earliest Time of Detonation
5. Desired Ground Zero (Location)
6. Burst Type
7. Minimum Safe Distance
8. Effective Wind
9. Down Wind Distance of Zone
10. Cloud Radius

Table 4. Staff information needs (continued).

aaa. Radiation Dose Status

1. Unit ID
2. Effective Time
3. Cumulative Dosage

aab. NBC Reports

1. NBC I - Transmitted as soon as sufficient information is available on type of NBC attack. (Initial report and subsequent data.)

2. NBC II - Used by all echelons of the Joint Task Force who evaluate the effects of a nuclear, biological, or chemical attack in their respective area of operations.

3. NBC III - Provides for immediate warning of expected chemical, biological, or radiological contamination or hazardous area.

4. NBC IV - Used to report the measured dose rate and decay level resulting from nuclear detonations.

5. NBC V - Used to report areas of chemical, biological, or radiological contamination or hazard.

aac. Civilian/Military Operations Situation

1. Host Nation Support
2. Cooperation Programs
3. Resources Available
4. Government Control
5. Civil Defense Status

aad. Psyop Status

1. Significant Activities
2. Operation Description
3. Area (Location) of Operation
4. Results Expected/Observed

Table 4. Staff information needs (continued).

aae. PW/Civilian Detainee Status

1. Numbers, Male/Female, Off, NCO, EM, Civ
2. Medical Evacuees
3. Locations
4. Collection Points

Table 5. External agencies required to be represented.

Division Level	Corps Level	Key for Table 2-3
Brigades	Division/Sep Brigade	BDE
DISCOM/RAOC	COSCOM/RAOC	SPT
Covering Force/ACS	Covering Force/ACR	CF
DIVARTY	Corps Artillery	FAHQ
ADA Bn	*ADA Gp	ADHQ
Aviation Bn	*Aviation Gp	AVHQ
Signal Bn	Signal Bde	SIG
Engineer Bn	*Engineer Bde	ENHQ
CEWI Bn	CEWI Gp	CEWI
MP Co	*MP Bde	MP
NBC Def Co	*NBC Def	NBC
Common		
*Psychological Ops		PSY
*Civil Affairs		C/A
Reinforcing/Uncommitted Reserve Units		RSRV
Medical Facilities		MED
Detention Facilities		JAIL
Adjacent Units		ADJ
Higher Headquarters		HGHR
US Air Force		USAF
US Navy		NAVY
Subordinate Unit ASIC		LWR
Communications Intel (COMINT)		COMI
Electronic Intel (ELINT)		ELI
Imagery		IMAG
Moving Target Indicators (MTI)		MTI
Human Intel (HUMINT)		HUMI
Host Nation		HOST

*Size of Hq determined by mission requirements and subordinate units assigned.

Table 6. Information exchange between trainee staff and external agencies.

N SQUARE REPORT BY USAICS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION
OPS	BDE	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		H	STATUS TRANS FACILITIES
		I	PROBABLE ENEMY C OF A
		J	ADA PRIORITIES
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	SPT	G	SIG ENEMY ACTIVITIES
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	CF	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		H	STATUS TRANS FACILITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	CFWI	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES
		AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT
		AX	EW TASKING
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	NBC	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES
		AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	MP	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	FAHQ	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS
		AAB	NBC REPORTS
	ADHQ	A	TERRAIN
		B	WEATHER
		C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON
		F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
OPS	ADHQ	AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	AVHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	ENHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	SIG	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	HQHR	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
	USAF	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS
		Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	ADJ	G	SIG ENEMY ACTIVITIES	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	RSRV	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
BDE	OPS	C	ENEMY 1ST ECHELON	E	ENEMY CONC TO 300KM	G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	J	ADA PRIORITIES	K	ADA STAT/COVERAGE
		L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	Q	TASK ORG FOR COMBAT	R	COMM STATUS
		S	ASSETS (MATERIEL) AVAIL	U	RESERVE/UNCOM FORCE STAT	V	A/C RQMTS/PROJECTIONS
		AN	ADM MISSIONS	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
BDE	LOG	AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AT	AMMO RSR	AU	AMMO CSR		
	TCSS	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
	TOPS	C	ENEMY 1ST ECHELON	E	ENEMY CONC TO 300KM	G	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF .	J	ADA PRIORITIES	K	ADA STAT/COVERAGE
		L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	Q	TASK ORG FOR COMBAT	R	COMM STATUS
		S	ASSETS (MATERIEL) AVAIL	U	RESERVE/UNCOM FORCE STAT	V	A/C RQMTS/PROJECTIONS
		AN	ADM MISSIONS	AAB	NBC REPORTS		
SPT	OPS	G	SIG ENEMY ACTIVITIES	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		Q	TASK ORG FOR COMBAT	R	COMM STATUS	U	RESERVE/UNCOM FORCE STAT
		AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	U	RESERVE/UNCOM FORCE STAT
		AO	SUPPLY POINT LOC/CAP	AP	TRANS STATUS	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS				
CF	OPS	C	ENEMY 1ST ECHELON	G	SIG ENEMY ACTIVITIES	L	ARTY STATUS
		N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	AN	ADM MISSIONS
		AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
	TCSS	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
	TOPS	C	ENEMY 1ST ECHELON	G	SIG ENEMY ACTIVITIES	L	ARTY STATUS
		N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	AN	ADM MISSIONS
		AAB	NBC REPORTS				
CEWI	OPS	G	SIG ENEMY ACTIVITIES	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	S	ASSETS (MATERIEL) AVAIL	AAA	RADIATION DOSE STATUS
		AAB	NBC REPORTS				
	LOG	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES	AQ	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
NBC	OPS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		S	ASSETS (MATERIEL) AVAIL	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
NBC	LOG	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES	AQ	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
MP	OPS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		S	ASSETS (MATERIEL) AVAIL	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AT	AMMO RSR	AAE	PW/CIV DETAINEE STATUS		
FAHQ	FSE	L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL
		T	CRITICAL PERSONNEL (MOS)	AA	EQUIP LOSSES	AB	PERSONNEL LOSSES
ADHQ	DAME	K	ADA STAT/COVERAGE	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL
		T	CRITICAL PERSONNEL (MOS)	AA	EQUIP LOSSES	AB	PERSONNEL LOSSES
AVHQ	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES		
ENHQ	ENGR	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES	AL	MINEFIELDS/OBS/BARRIERS
		AN	ADM MISSIONS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
SIG	CE	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS				
HGHR	OPS	N	CRITICAL/SERIOUS INCIDENTS	AD	OP/FRAG (MOD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AG	CMD CNTRD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AV	ADJ/FRIEND SIT/ACT	AZ	STRIKE WARNINGS		
	LOG	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTRD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AR	SUPPLY STAT BY CLASS
		AU	AMMO CSR				
	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
HCHR	ASIC	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		AF	COMMAND/G2 EEI				
	FSE	Z	ENEMY ADA SUPPRESS RQMTS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AK	PLANNED TGTS & PRIORITIES	AU	AMMO CSR	AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
	ADMN	AI	PERSONNEL REPLACE PRIORITIES				
	DAME	J	ADA PRIORITIES	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS
		AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AK	PLANNED TGTS & PRIORITIES
		AU	AMMO CSR	AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	ENGR	H	STATUS TRANS FACILITIES	N	CRITICAL/SERIOUS INCIDENTS	AL	MINEFIELDS/OBS/BARRIERS
		AN	ADM MISSIONS	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	CE	N	CRITICAL/SERIOUS INCIDENTS				
	C/MO	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	R-G4	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AG	CMD CNTRLD/CRIT ITEMS
		AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT
		AR	SUPPLY STAT BY CLASS	AU	AMMO CSR		
	CPOC	AI	PERSONNEL REPLACE PRIORITIES				
	RCMD	N	CRITICAL/SERIOUS INCIDENTS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
USAF	OPS	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AZ	STRIKE WARNINGS				
	LOG	H	STATUS TRANS FACILITIES				
	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES	AK	PLANNED TGTS & PRIORITIES		
ADJ	OPS	G	SIG ENEMY ACTIVITIES	N	CRITICAL/SERIOUS INCIDENTS	AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS	AAB	NBC REPORTS
	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES				
RSRV	OPS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT	U	RESERVE/UNCOM FORCE STAT

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
RSRV	OPS	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
LOG	BDE	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP	AQ	MOVEMENT RQST/ROUTING
		AU	AMMO CSR				
	SPT	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AU	AMMO CSR		
	CF	AQ	CMD CNTRLD/CRIT ITEMS	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
	CEWI	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	NBC	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	MP	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	FAHQ	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	ADHQ	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	AVHQ	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	ENHQ	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	SIG	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	HQHR	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AT	AMMO RSR		
	USAF	V	A/C RQMTS/PROJECTIONS				
	RSRV	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS		
ASIC	HQHR	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
ASIC	HGHR	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		AF	COMMAND/G2 EEI				
	ADJ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES				
	COMI	AX	EW TASKING				
	ELI	AX	EW TASKING				
	IMAG	AX	EW TASKING				
	MTI	AX	EW TASKING				
	HUMI	AX	EW TASKING				
	LWR	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		AF	COMMAND/G2 EEI				
COMI	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES				
ELI	ASIC	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES		
IMAG	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES				
MTI	ASIC	B	WEATHER	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON
		E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
HUMI	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES				
LWR	ASIC	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES
		I	PROBABLE ENEMY C OF A	R	COMM STATUS	AF	COMMAND/G2 EEI
FSE	FAHQ	Q	TASK ORG FOR COMBAT	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
FSE	FAHQ	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AU	AMMO CSR
		AZ	STRIKE WARNINGS				
	HGHR	S	ASSETS (MATERIEL) AVAIL	AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS		
	NAVY	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS		
NAVY	FSE	L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES				
ADMN	HGHR	T	CRITICAL PERSONNEL (MOS)				
	P&A	AI	PERSONNEL REPLACE PRIORITIES				
	MEDI	AI	PERSONNEL REPLACE PRIORITIES				
	JAIL	AAE	PW/CIV DETAINEE STATUS				
	MSC	AI	PERSONNEL REPLACE PRIORITIES				
P&A	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES		
MEDI	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES	AC	MEDICAL STATUS
JAIL	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES	AAE	PW/CIV DETAINEE STATUS
MSC	ADMN	O	UNIT LOCATIONS/STATUS	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES
	DAME	V	A/C RQMTS/PROJECTIONS				
	CE	O	UNIT LOCATIONS/STATUS	R	COMM STATUS		
	C/MD	AAC	CMD OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS
	R-G4	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AO	SUPPLY POINT LOC/CAP	AP	TRANS STATUS	AG	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
MSC	CPOC	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES		
	RCMD	N	CRITICAL/SERIOUS INCIDENTS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
	PMO	AAE	PW/CIV DETAINEE STATUS				
	SURG	AC	MEDICAL STATUS				
	R-G5	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	R-G1	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES	AC	MEDICAL STATUS
DAME	ADHQ	J	ADA PRIORITIES	G	TASK ORG FOR COMBAT	Z	ENEMY ADA SUPPRESS RQMTS
		AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AU	AMMO CSR	AZ	STRIKE WARNINGS		
	AVHQ	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS
		Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT
		AU	AMMO CSR	AZ	STRIKE WARNINGS		
	HQHR	S	ASSETS (MATERIEL) AVAIL	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS
		AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AZ	STRIKE WARNINGS				
	USAF	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS
	NAVY	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS
	MSC	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES		
TCSS	BDE	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
	CF	AQ	CMD CNTRLD/CRIT ITEMS	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
TOPS	BDE	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		G	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	CF	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
TOPS	CE	D	ENEMY 2ND ECHELON	E	ENEMY (INK TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AD	OP/FRAG (RD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	AIR	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS
		Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
ENGR	ENHQ	H	STATUS TRANS FACILITIES	Q	TASK ORG FOR COMBAT	AJ	PRIORITY SUPPORT TO CMBT
		AL	MINEFIELDS/OBS/BARRIERS	AM	ENGR SIT RQMTS	AN	ADM MISSIONS
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	HQHR	H	STATUS TRANS FACILITIES	N	CRITICAL/SERIOUS INCIDENTS	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AL	MINEFIELDS/OBS/BARRIERS	AN	ADM MISSIONS
		AW	CRIT SIT ALERT				
CE	SIG	N	CRITICAL/SERIOUS INCIDENTS	R	COMM STATUS	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AQ	CMD CNTRLD/CRIT ITEMS
	HQHR	N	CRITICAL/SERIOUS INCIDENTS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
	MSC	R	COMM STATUS				
HOST	C/MO	H	STATUS TRANS FACILITIES	AAC	CMD OPS/SIT	AAD	PSYOP STATUS
C/MO	HQHR	AAC	CMD OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS
	MSC	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	HOST	AAC	CMD OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS
	PSY	AAD	PSYOP STATUS				
	C/A	AAC	CMD OPS/SIT				
PSY	C/MO	AAD	PSYOP STATUS				
C/A	C/MO	AAC	CMD OPS/SIT				
AIR	TCSS	H	STATUS TRANS FACILITIES				

Table 6. Information exchange between trainee staff and external agencies (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
AIR TOPS		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS
R-G4	HGHR	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS	AT	AMMO RSR		
	MSC	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS	AT	AMMO RSR	AU	AMMO CSR
CPOC	MSC	T	CRITICAL PERSONNEL (MOS)	AI	PERSONNEL REPLACE PRIORITIES		
PMO	MSC	AP	TRANS STATUS	AAE	PW/CIV DETAINEE STATUS		
SURG	MSC	AC	MEDICAL STATUS				
R-G5	MSC	AAC	CMO OPS/SIT	AAD	PSYOP STATUS		
R-G1	HGHR	T	CRITICAL PERSONNEL (MOS)	AI	PERSONNEL REPLACE PRIORITIES		
	MSC	T	CRITICAL PERSONNEL (MOS)	AC	MEDICAL STATUS		

For a division level exercise the following controller station hardware sets are estimated:

- Brigade S1-S4 (each brigade)
- Brigade S2-S3 (each brigade)
- DIVARTY, ADA Bn, Aviation Bn
- DISCOM, RAOC, Medical, MP
- Armd/Air Cav Sqdn
- Adjacent unit, other services, host nation, psyops, civil affairs
- CEWI, other intelligence sources
- Corps G1-G4
- Corps G2-G3
- Corps Arty, ADA, AVN
- Corps Engineer, Signal, NBC, other
- Opposing Forces

Some consolidation of these stations may be possible depending on time requirements for interaction with the simulation. It may be possible to provide multiple display monitors within a station with only one input console. For example, the brigade staff might be consolidated in one station; the ACS might be consolidated with one of the brigades; and it may be possible to consolidate many of the combat support/combat service support functions into a single station.

For a corps level excercise the following is an initial estimate of controller station requirements:

- Division G1-G4, Medical, Engineer (each division)
- Division G2-G3, NBC, Signal (each division)
- Division DAME, FSE, TACP (each division)
- Intelligence (division, higher, other) sources, CEWI Gp
- COSCOM, RAOC, Medical, MP
- Armd Cav Regiment
- Adjacent units, other services, host nation, psyops, civil affairs
- Corps Arty, ADA Gp, Aviation Gp
- Engineer Bde, Signal Bde, NBC Unit
- Theater Army CSS
- Theater Army Ops
- Opposing Forces

The same qualifications, as mentioned above for the division level, apply to the possible consolidation of stations. The primary requirement is to provide sufficient personnel to simulate the real operational environment to the trainee staff. The training system and any exercises using it will be of little or no value if the trainee staff

is not kept busy by a complete loading of the information system. This can only be done through the reports, requests, and orders for subordinate and higher headquarters.

2.5 FLEXIBILITY

A staff training simulation for corps and division command groups must be extremely flexible. When the simulation is used for training a division command group, many of the corps functions will have to be simulated. When used for training a corps command group alone many of the division and brigade functions must be simulated. Given the flexibility and capability to train either of these command groups singly, the simulation should be easily adaptable to the training of a corps command group with one or more actual division command groups and others simulated.

In addition to flexibility in training configuration, the simulation must have extreme flexibility in the representation of forces, missions, and locations of the simulated operations. The Army currently has five active corps headquarters and sixteen active divisions. These organizations have a wide variety of missions in many areas of the world and are manned and equipped differently to accomplish their missions. Even in those organizations that are similar in structure and mission, commanders tend to organize and utilize their staff in different ways. The training simulation system must be able to accommodate to these differences to provide training for staffs in a realistic environment. The simulated environment must be realistic in terms of the forces controlled, the threat forces, the missions assigned, the area of operations, and the methods of staff operation which the commander and senior staff desire.

The flexibility required of the simulation implies a high degree of modularity in its architecture to allow substitutions, additions, and/or deletions of functions required for a particular exercise.

2.6 SUMMARY

The division and corps command groups require a training system which will provide for realistic combat operation of the staff and provide a means of measuring the accomplishment of their training objectives. The training

system must accomplish much more than simply simulate combat for the staff to respond to. It must simulate fully the battlefield of concern to the trainee staff; combat, combat support, combat service support, and other service functions. It must provide information to the trainee staff in a realistic manner, including the many telephone/ radio conversations held by these staffs with higher, subordinate, and adjacent units. The battlefield simulation must provide information to, and accept input from, the control personnel which represent these external agencies and must respond in a realistic manner to the orders and directions which are input. The control functions must be simplified and quickly taught so as to reduce the need for permanently assigned controller personnel. The training system must provide feedback to the trainees for the assessment of how well the training objectives are met and the establishment of future training objectives. The system must have the flexibility to provide the needed training to either division or corps command groups or both, with adjacent divisions simulated if necessary. It must be able to accommodate the variation in methods of staff operation found in different commands.

SECTION 3

MODEL REVIEW, EVALUATION, AND COMPARISON

3.1 MODEL REVIEW AND EVALUATION

Armed with the overall need, a concept, and a definition of requirements for a division/corps training simulation, the next logical step is to inventory what models and simulations are currently available and to analyze their adaptability to meet the requirements. A match between training simulation requirements and an existing model/simulation would be a giant step to meeting the short-term (two year) training development goal and would provide a test bed from which to meet the long-term goal.

The technical assessment of selected Army models prepared by the MITRE Corporation (November 1982) as an input to the Army Model Improvement Program provided an initial shopping list of models and simulations. This source was limited in scope, and a much wider search was initiated to identify models and simulations which currently exist in the battle simulation community and which could logically support the short-term development of the training simulation. From the search it was obvious that no existing model could meet the division/corps training simulation requirements; therefore, the available models were screened to identify candidates for more detailed analysis, and the following were selected:

ARTBASS
FOURCE
JANUS
MTM
STAR
TACSIM
VECTOR-3

Additional documentation, varying in extent of coverage for each model, was obtained and examined. Due to a short time frame available for this effort, the analysis contained in this chapter is based on documentation that could be obtained quickly. The documentation used, therefore, varied considerably among the models surveyed. Within the scope, time, and effort of this study, no in-depth analysis of the models was possible. The objective of the examination was to determine which of the models was best suited to be cost-effectively modified to serve as a base for the division/corps training simulation.

Chapter 3 presents a general, functional, and system description of the candidate models. Criteria were established for a comparative evaluation of these models. Table 7 provides definitions of the criteria and a ranking of their importance to the training system. These criteria are addressed in the evaluation of each model. Chapter 3 is concluded with a comparison of the general model characteristics, the functional representations in each model, and the comparative evaluation against the criteria of Table 7. The results of the model evaluations and comparison discussed in this chapter will contribute directly to a strategy for the short-term development of a division/ corps training simulation (Chapter 4).

3.1.1 Army Training Battle Simulation System (ARTBASS)

3.1.1.1 General Description -

ARTBASS is a computer-based, free play, interactive, two-sided engagement training simulation that is used to provide training for battalion comand groups (commanders and their staffs) by realistically simulating ground combat operations between friendly and enemy forces. The command and control at battalion level is represented live by the battalion command group while higher, lower, adjacent, and supporting organizations are played by role playing controllers who interface between the command group and the mathematical model/computer system which simulates combat, combat support, and combat service support operations. The mathematical model is a large, detailed, computer time-step simulation of the tactical battlefield environment, including detections, engagements, weapon firings, casualty assessment, movement (including movement suppression), and environmental effects. ARTBASS is designed as a training simulation rather than an operations evaluation tool, and the

Table 7. Criteria for evaluation of existing simulations.

Criterion	Definition	Importance To Training System
Part I. Criteria Applicable to the Model as a Whole.....		
Modifiability		
[1]Modularity - 1	Degree to which events and phenomena are coded and documented independently of each other	High
[2]Modularity - 2	Degree to which new modules (portraying new events or phenomena) can be added and/or old ones deleted	High
Adequacy of Documentation	Degree to which clearly written information about model details, as well as its overall character, is available	High
Developer's Support and Sponsorship	Degree to which model developer is interested in the use of his model as a staff training simulation and is willing to contribute to its use for that purpose	Low
Ease of Use		
Ease of Scenario/ Data Generation	Ease with which scenarios (and data characterizing them) can be generated for the model	Med
Support of Role Players	Degree to which model provides output and accepts input commands from role playing controllers	High
Ease of Data Reduction and Interpretation	Ease with which model outputs can be interpreted and made available to the controllers/role players	Med
Friendliness of User Interface	Ease with which users interface with the model	Med

Table 7. Criteria for evaluation of existing simulations (continued).

Criterion	Definition	Importance To Training System
Availability		
Acceptability	Degree to which model is acceptable to Army customer (and to Army at large)	High
Cost	Cost of obtaining and maintaining the model	Med
Running Speed	Degree to which model is able to portray events is simulated real time.	High
Part II: Criteria Applicable to the System and Measurement Submodels.....		
[2]Credibility	Degree to which model produces outputs which are credible to the users	High
Adequacy	Degree to which model portrays events and phenomena of interest for training	High
[2]Accuracy	Degree to which model's portrayals of events and phenomena are accurate representations of reality	Low
Understandability	Degree to which model's portrayals are understandable and traceable.	Med
Variety	Degree to which model can produce a variety of outputs for the same inputs	Med
Part III: Criteria Applicable to the Data Interpretation Submodels.....		
[2]Credibility	Degree to which model's portrayal of events is reasonable and apparently	High
Adequacy	Degree to which model portrays the types of data reduction and interpretation of interest for purposes of training	High
Part IV: Criteria Applicable to the Control Submodels.....		
Applicability	Degree to which model supports command and staff functional training	High

Table 7. Criteria for evaluation of existing simulations (continued).

Notes:

1. A principal requirement that must be placed on a combat model to support a staff training simulation is that its portrayal of command/control functions be modular. This modularity is needed in order to be able to accommodate various subsets of corps and division staffs as trainees. More specifically, these command/control portrayals must be such that the modules which are being played by the trainees or the role players can be readily suppressed in the model. This, in turn, leads to a requirement that the interfaces between command/control modules in the model be extremely clean and well defined. These considerations account for the inclusion of the criteria listed under "modifiability" in Part I of Table 3-1, and to the "applicability" criterion for portrayal of command/control functions in Part IV.

2. The credibility of the events and phenomena that are presented to the trainees is of much greater importance than, say, the accuracy of the portrayal of these events. If the model were to be used instead as an analytical tool, just the opposite would be true: the model's accuracy in portraying events and phenomena would be much more important than its credibility. For this application, credibility or believability of the model's output as seen by the trainee is of higher importance than the accuracy of representation of real phenomena. (Of course, one way for a model to be credible is for it to be accurate; i.e., accuracy implies credibility, but not vice versa.)

overall concept for ARTBASS accounts for future growth capability to permit the system to be expanded to handle exercises to at least brigade level. ARTBASS was developed by the Singer Company (Link Division) under the auspices of the Command Group Training Support Systems (CGTSS) Special Study Group (SSG), and its present proponent is the US Army Combined Arms Center, Fort Leavenworth , Kansas.

3.1.1.2 Functional Description -

ARTBASS and its system cadre are mobile and may be moved to the Army post of the unit to be trained. The battalion command group plays live while controllers play all roles external to the battalion command group. The battalion command group establishes its command post, echeloned as appropriate, and establishes communications with the system controllers. ARTBASS provides the battalion command group with simulated capability to maneuver combat, combat support, and combat service support units as freely as they would in actual combat. The command group is permitted to apply and coordinate fires including direct and indirect fires, Air Force close air support, Army attack helicopters, organic and direct support weapons, and air defense fires. Based upon controller-supplied information, the battalion command group can analyze the tactical situation and exercise a full range of command and control activities. Friendly units are modeled to platoon level, and OPFOR units are modeled to company level.

ARTBASS controllers provide a realistic combat training environment by reacting to data input by the command group and inputting that data into the computer system. Based upon computer system responses to the inputs, controllers provide pertinent tactical, administrative, and logistical information to the command group. Graphic displays of terrain, unit positions, and control measure data assist the controllers in their role playing capacity.

A functional description of ARTBASS is shown in Figure 18 and brief descriptions of the system and major subsystems are presented below.

The Executive and Simulation Control System controls the processing sequence of the mathematical model elements and the interactive program requests. It operates to ensure that each system is executed in the proper order during each mathematical model time-step as well as to ensure that the proper subroutines are executed in the correct order during initialization and termination of an exercise.

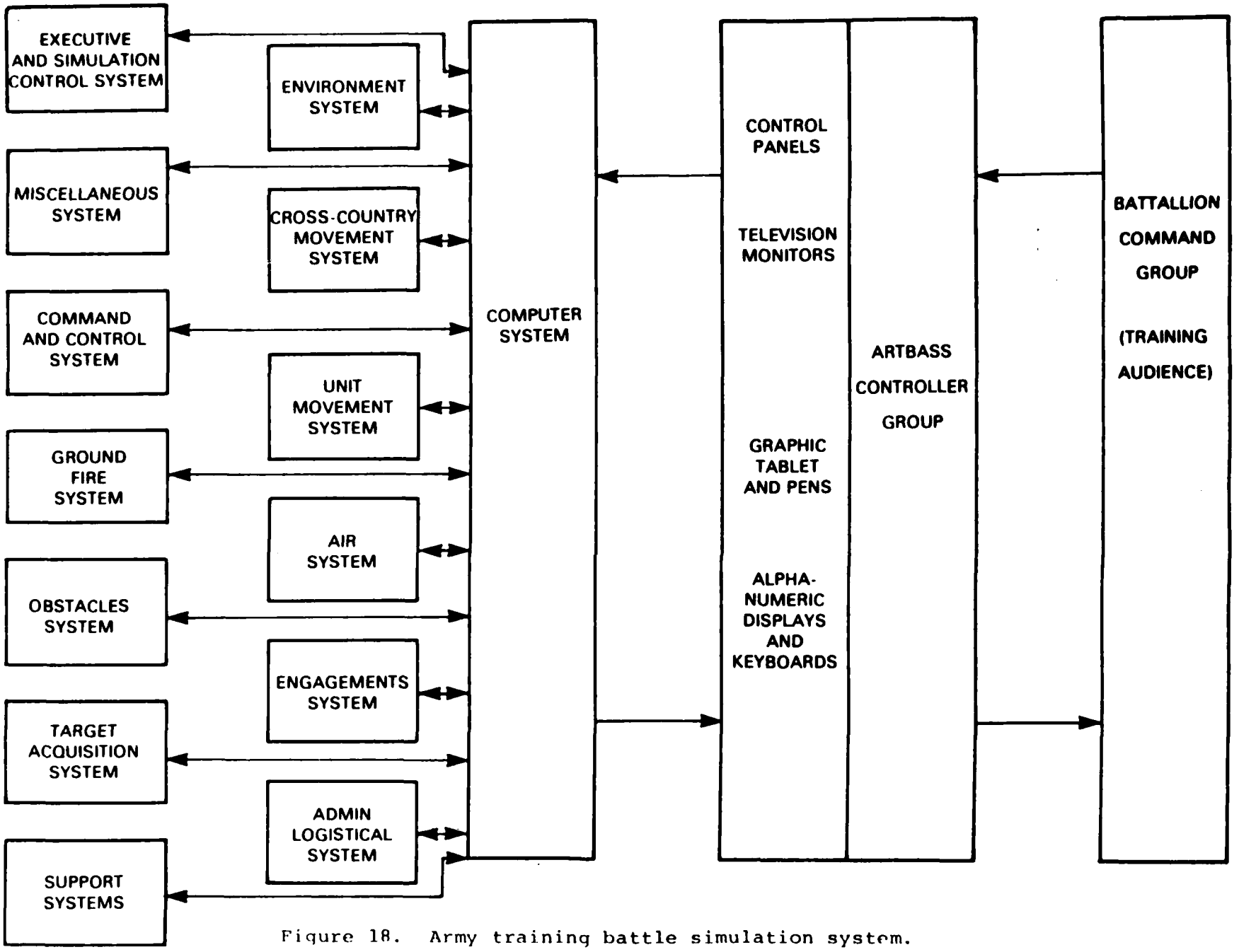


Figure 18. Army training battle simulation system.

The Environment System provides a representation of the terrain for the purpose of computing intervisibility between any two points. It determines the presence of obstructions in the relief as well as the probability of target and observer concealment based upon relief details, vegetation, obstacles, and cultural features. Finally, it determines weather conditions at any time during the simulation and at any point in the exercise area.

The Miscellaneous System consists of unrelated modules shared between software systems and of modules performing utility functions.

The Cross-Country Movement System calculates a new rate of movement each time-step as a function of the unit's current location, the direction faced, and the terrain class across which the unit will move. Subroutines calculate bridge building, road and bridge damage assessment, as well as the rate of movement. The system also considers blocks sustained from air-delivered weapons as well as the damage inflicted on the moving unit by air attack.

The Command and Control System controls a diverse variety of events and actions associated with maneuver and fire but also including such control activities and measures related to weather, resupply, preconstructed alert messages, unit size, unit removal from the exercise, air missions, air defense, preplanned missions, and others. The maneuver and fire command and control instructions are input to the simulation using an events processor and decision tables.

The Unit Movement System models the movement of all ground units to the unit's ultimate destination as well as to each successive minute-to-minute destination. The disruptive effect of the encountering of obstacles as well as the environmental degradation affecting movement are also modeled.

The Ground Fire System controls the allocation of direct and indirect fire weapons against opposing force targets, controls the allocation of supporting fire weapons, responds to controller fire commands, and assesses casualties resulting from effects of direct fire and indirect fire weapons for both friendly and enemy forces. The system also calculates the suppression of the units ability to fire and move as well as the resulting opposing force ratios.

The Air System performs all calculations necessary to the function of air units within the model, including air unit position, air delivered weapon effects, and air defense weapon effects. For each ground time-step, at least four

air time-steps (normally 15 seconds) are calculated.

The Obstacle System determines whether a given ground unit encounters an obstacle during a time step. The impeded unit moves to the near edge of any obstacle, suffers a delay time while the path through the obstacle is established, and then moves across the obstacle.

The Engagements System contains logic which governs the positioning of opposing ground units during confrontations, directs units towards the center of greatest enemy threat, determines whether an engagement can be initiated as a result of enemy contact, and once the engagement has been initiated, maintains the engagement by mobilizing opposing forces against each other. The system also determines whether a unit will be allowed to fire its direct fire weapons against an enemy. Finally, the system handles the eventual withdrawal of a unit from engagement.

The Target Acquisition System models the occurrence of both ground and air detections from the appropriate sensors available to the ground and air units. Sensors include visual, radar, aural, and remote systems. The system operates stochastically in determining detections.

The Logistical and Administrative System assesses the status of equipment and crews, the status of supplies, and the status of personnel. It assesses damage to equipment through encounters with obstacles as well as through maintenance attrition. The system updates personnel status for each time-step for each unit in the model and calculates the readiness status of each unit. Supply status is calculated for fuel and ammunition only based upon consumption rates for each unit.

Support systems include input/output activities, data base manipulation, and graphics presentation.

3.1.1.3 System Description -

ARTBASS is designed as a mobile/portable system which can be rapidly deployed and positioned at existing Army facilities. It relies on the using organization's command post and communications facilities and capabilities. Two commercial type semitrailer vans house the computing system and the power generation and control facility equipment. The system makes use of automated display devices, multifunction keyboards, cursor control bit pads, control I/O terminals, and control station printers.

ARTBASS currently executes on Perkin-Elmer computer systems; namely, a main processor consisting of a Perkin-Elmer Dual 3240 and a Perkin-Elmer 3220 which handles the control interface processing between the main processor and the controller stations. The disk/CPU, bus switch, card reader, line printer, magnetic tape units, and computer operator consoles are all standard Perkin-Elmer supplied devices.

3.1.1.4 Model Evaluation -

ARTBASS, as a system as well as a simulation model, is evaluated in terms of criteria established in Table 7. Since ARTBASS is presently transitioning from a development system to an operational system, some of the evaluations will be an extrapolation of its immediate predecessor, CATTS, which provided the advanced development model for ARTBASS.

3.1.1.4.1 General Acceptability -

ARTBASS well represents, deterministically and stochastically, the battle events and phenomena which occur at battalion task force level. The key combat activities are modeled independently yet operate interactively in a highly realistic battlefield simulation. The model structure invites the addition of new modules as well as submodels to existing modules. The mathematical model, including its systems and routines, is exceptionally well documented and includes enhancements initiated in 1981. The developer is extremely interested in the use of his model as a staff training simulation at battalion task force, and possibly brigade, level.

Scenarios and data bases at battalion level have been generated and are relatively easy to prepare from data available to the Combined Arms Center. Data and scenario preparation for a division or corps would be extensive (estimated 6 man-months); however, specific experience data for assessing preparation time and resources are not available. The model is specifically designed for role playing by both the training audience and controller personnel, and fulfills the design requirements for role playing exc ptionally well. Model calculations are reduced and are output to controllers in highly useful form; however, by design, direct outputs are not made to the training audience. Controllers/interactors interface with the mathematical model with considerable ease.

CATTS, the predecessor of ARTBASS, was well received by users as a battalion command group training tool. Command groups participate enthusiastically and appear to benefit significantly by the training experience. Repetitive use of the simulation appears to enhance the training benefit. ARTBASS development costs have already been expended, and the system is Government property. Costs to maintain ARTBASS cannot be predicted but would appear to be reasonable.

3.1.1.4.2 System and Measurement Models -

Each system (model) of ARTBASS represents force interaction phenomena with highly credible results. The results are translated realistically to command group player personnel for military decision making and force supervision. A variety of outputs can be created and presented to controller personnel with relative ease.

3.1.1.4.3 Data Interpretation Models -

The systems inherent to the mathematical model separately accept and operate upon input data. Additionally, there is a high and appropriate degree of interactivity among the systems so as to properly interpret the data for exercise output. The human interface (in the form of controllers/interactors) is essential to effective exercise play, and this interface requires training and good understanding of realistic and aggressive role playing in the exercise.

3.1.1.4.4 Control Models -

Controllers must input data to appropriate functional elements of the battalion command group in order to achieve the training objectives. The software of the system does not output data directly to staff functional elements. Additionally, the model does not simulate the performance of staff functions at higher, lower, and adjacent organizations but relies upon the role playing by controllers to provide functional information to the appropriate staff section of the command group.

To the extent to which it is played in the battalion task force scenario, ARTBASS supports command and staff activities at tactical operations center (TOC), alternate TOCs and combat trains locations.

3.1.2 Command, Control, Communications, and Combat Effectiveness (FOURCE) Model

3.1.2.1 General Description -

The FOURCE Model is a deterministic, division level, force-on-force, mathematical combat model which executes without player intervention. Force units are resolved at battalion level. The command, control, and communications processes are represented in great detail to allow examination of the contribution to force effectiveness of various command and control and intelligence system alternatives. Emphasis is given to the simulation of various aspects of staff performance and combat information/intelligence flow in order to measure the contribution of alternative command and control (C^2) and intelligence systems to the combat effectiveness of the force. Resolution of staffs and staff processes is to the individual work station and individual message levels. The FOURCE Model was developed by TRASANA as an analysis tool for the Tactical Operations System (TOS) Cost and Operational Effectiveness Analysis (COEA) and has been subsequently used for other investigations of command and control issues.

3.1.2.2 Functional Description -

The FOURCE Model consists of a control module and four interactive process modules which simulate iteratively performance of staff functions, acquisition of targets, control and directing of the battle, and interaction of opposing forces. A functional diagram of the model is shown in Figure 19, and the functions and interactions are discussed below.

The Maintain Simulation Control Module acts as an executive routine to handle input/output and exogenoous events and to maintain control of the simulation. This module is not shown in Figure 19.

The Fight the Battle Module simulates the movement and combat interactions of the friendly and enemy forces. The combat representation is in the form of armor/antiarmor direct fire engagements and combat support consisting of artillery, Army air (attack helicopters), and close air support. Direct fire engagement results are calculated for each 10 seconds of engagement using differential equations. Close air support and attack helicopter effects are

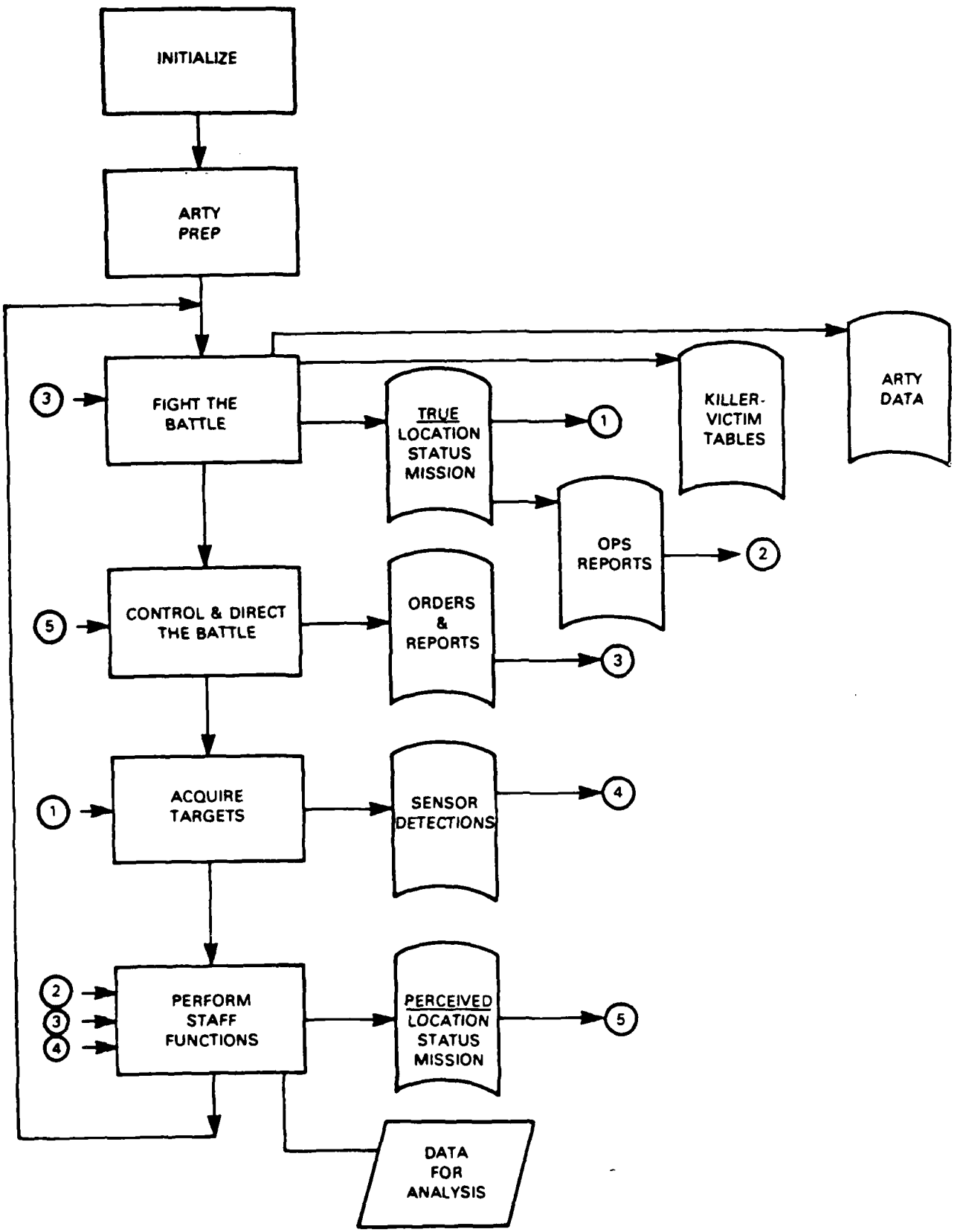


Figure 19. FOURCE model structure.

considered by adding combat power to the battalion sector at appropriate times. Artillery effects are calculated as a function of the firing weapon, target type, range, aim point, and target location. This module maintains the true battlefield situation on all forces. It controls the movement of units and elements, provides sensor and combat reports, and accounts for losses from direct and indirect fire weapons. Target acquisition for direct fire weapons is handled in this module.

The Control and Direct the Battle Module uses a decision rule structure to simulate the decision-making process. The rules operate on the information of the perceived combat situation received from the Perform Staff Functions Module, develops an estimate of the situation, makes decisions based upon friendly and enemy doctrine, and outputs orders for immediate implementation as well as reports and requests to the next higher/lower headquarters.

The Acquire Targets for Combat and Intelligence Module simulates the acquisition of targets for indirect fire weapons and for intelligence purposes. The target acquisition process in this module is a complement to the target acquisition process for direct fire weapons incorporated in the Fight the Battle Module. Targets are acquired by various sensor systems (ground surveillance radar, forward observers, unattended ground sensors, counterbattery radar, standoff target acquisition systems, and remotely piloted vehicles). Sensor information, filtered and degraded for processing and transmission delays, is fed to the other modules for action.

The Perform Staff Functions Module represents staff processing and intelligence creation for both friendly and enemy forces. The module receives operations and intelligence data and creates a perception of the battlefield at battalion, brigade, and division levels. This perceived situation is used by the Control and Direct the Battle Module for commanders' estimates of the situation and for decisions with respect to allocation of resources and for maneuver unit mission changes. Secondary processes provide data that may be used for the generation of artillery target lists; for generation of various reports of friendly units; and, depending upon their importance, for routing reports to higher headquarters. Intelligence reports are merged with exercise files and are routed to interested staff sections and to higher headquarters.

The FOURCE Model embodies no capability to simulate combat service support operations nor the command and control activities associated with such operations. In addition, there are some combat support operations (e.g., engineer) which are not represented in the model.

3.1.2.3 System Description -

The programs of the FOURCE Model are written in FORTRAN (UNIVAC ASCII FORTRAN) in 250 subroutines and contain two assembly languages for input/output. The model presently executes on a UNIVAC 1100/82 under EXEC8.

3.1.2.4 Model Evaluation -

The FOURCE Model is evaluated in terms of the criteria established in Table 7 as follows.

3.1.2.4.1 General Acceptability -

The FOURCE Model, from a design point of view, represents battle phenomena which are of direct interest to command and control training activities, despite the fact that the existing modules interact with each other without human intervention. A major shortfall in the design and operation of the FOURCE Model, however, is that it currently addresses only command, operations, and intelligence activities in combat and combat support roles; it does not simulate combat service support staff activities and operations. Additional submodules may be added with moderate effort and may be effectively integrated with existing models and submodels to expand the simulation to the desired scope. Existing documentation is clear and ample to facilitate the modular additions desired as well as to adapt the model from an analyis tool to a training vehicle. The TRADOC Systems Analysis Activity (TRASANA) developed the FOURCE Model, currently uses the model to address command and control issues, and is amenable to a projected use of the model for training purposes, fully knowledgeable that such use will provide valuable input for model refinement.

Scenarios for the FOURCE Model have been prepared by TRASANA, and the scenario preparation effort is extensive. Corps-level scenario preparation has not been attempted; however, division-level scenarios have been prepared. The data base preparation requirements are considerable, with an estimated nine man-months (16 calendar weeks) to prepare the data base and another five man-months (eight calendar weeks) to structure the data into model input format.

The model is principally used by TRASANA for analysis, and it was designed to run without human intervention. In its present form, therefore, it does not

support live staff play nor does it support role playing by controllers. The model structure does appear to lend itself to conversion to human intervention for training purposes.

In its present form, the FOURCE Model is operated with relative ease by analysts at TRASANA, and its frequency of use (approximately 120 times per year) brands it as user friendly.

The model is Government property and is available for use with a compatible computer system. Acceptability of the model by the Army at large appears high, particularly for the analytical purposes for which it was designed. While model logic is sound, reprogramming of the model for other than a UNIVAC 1100 System would entail some considerable effort and cost. Additionally, costs associated with redesign and programming to permit human intervention must be considered. Considerable additional cost and effort would be required to include combat service support simulation and control activities.

Execution time for the FOURCE Model varies as a function of output and total simulation time selected. Nominal division-level simulation to execution time is 16:1, and a twenty-hour simulated battle usually requires about four hours of computer time.

3.1.2.4.2 System and Measurement Models -

The FOURCE Model produces periodic user-controlled printouts, program-controlled printouts, and event-driven printouts, all of which would be very useful (though not complete) for role playing controllers. The outputs portray events and phenomena of interest which are sufficiently credible to support command and control training. To most effectively support role playing, printouts must be converted to visual displays in many instances. The mathematical submodels of FOURCE appear to realistically represent force and weapon employment and effects. Primary solution techniques within the system and measurement models include differential equations, probability, and queuing theory, the combination of which produce acceptable and reasonably credible representation of battle phenomena.

3.1.2.4.3 Data Interpretation Models -

The situation portrayal, unit compositions and locations, staff processing statistics, communications utilization, resource allocation, missions and roles,

time relative combat effectiveness, and similar data interpretations are reasonable and sufficiently realistic for training purposes. Additional data interpretation will probably be required to adequately support role playing by controllers.

3.1.2.4.4 Control Models -

The Maintain the Simulation Control Module of FOURCE appears to effectively control input and output as well as maintain control of the simulation. The simulation integrates battalion, brigade, and division staff actions in simulating battle results; however, operations and intelligence reports may be generated at battalion, brigade, and division level. No attempt has been made to apply the model at corps level. A perception of the battlefield situation can be gained through the hierarchy of command.

3.1.3 JANUS Model

3.1.3.1 General Description -

The JANUS Model (not an acronym but named for the two-faced Roman god) is a computerized, interactive ground combat simulation model utilizing dynamic graphics representation for game play. The model permits detailed treatment of nuclear, chemical, and conventional military systems and digitized terrain. JANUS is basically a two-sided, high resolution, stochastic simulation in which ground combatants include tanks, antitank guided missiles, field artillery, and air defense systems appropriate for brigade level combat. Air systems are currently limited to helicopters, and systems are available for delivery of chemical and nuclear munitions. Minefields are also represented in the model. Successful games have been conducted at brigade level, and future applications at division and possibly corps level are planned.

The JANUS Model was developed under the auspices of the Lawrence Livermore National Laboratory and is maintained by that laboratory. Model improvements are in progress.

3.1.3.2 Functional Description -

Written information about the JANUS Model is extremely limited as is the model documentation; therefore, the functional description is presented in general terms only.

JANUS is exercised as a two-sided game, each side being represented by two gamers. Force components consist of item level systems (tanks, field artillery, etc.), and the item level systems are the basis for game play. Item level systems may be aggregatd to form units of up to company size, although they have been aggregated to model force interactions for organizations up to brigade level.

Terrain is represented using Defense Mapping Agency digitized terrain data, and several levels of terrain resolution may be dynamically selected during the game. Terrain directly affects intervisibility, target acquisition, firing assessments, and land movement.

Weather is represented principally for its effect on target acquisition; however, appropriate weather environmental conditions influence nuclear and chemical munitions assessment.

Force interactions occur in any direction; i.e., they are not directionally oriented by the presence of a forward edge of the battle area (FEBA) trace. The gamers control the maneuver of direct fire ground forces and control both the maneuver and firing activities of fire support units. The play of the game is event driven, and force updates occur as required, not by fixed period. The game runs in real time as decisions are input and as actions occur. Battle simulation durations have been typically limited to 3-4 hours.

Gamer-input unit movement paths translate to unit missions (e.g., attack, delay, withdraw). Ground and air movements (helicopters only) are specified similarly. Air defense missions against helicopters are permitted. Field artillery fire and maneuver as well as counterfire and countermaneuver missions are modeled, with heavy emphasis on nuclear and chemical fire missions. Communications are not modeled, nor is combat service support. Ammunition (Class V) may be changed by the player during game play.

Casualties are assessed on an item level basis, and direct fire engagements continue as long as established conditions prevail. Gamers may, however, move units out of contact. Indirect fire engagements are terminated by the gamers. Nuclear and chemical effects are explicitly calculated as they relate to personnel, equipment,

vegetation, and urban areas, and radiation levels are dynamically maintained.

The basic unit level for decision making is a user-defined aggregation of item level systems displayed as a single symbol on the screen. Dynamic gamer interactions using graph tablets and function boxes represent the primary method of specifying decision rules and of fighting the battle. Color graphic monitors display most major terrain features as well as the location and identification of all friendly and acquired enemy units. The gamers also have access to decision aids (e.g., characteristics of weapon systems). The basic processes of acquisition, fire and movement, and casualty assessment, as well as the status of forces, are directly affected by the gamers' input decisions.

The JANUS Model provides analysts a tool that can be used to study rapidly specific aspects of tactics or to examine the advantages of new weapon system capabilities on the conventional/chemical/nuclear battlefield.

3.1.3.3 System Description -

The JANUS Model currently executes on a Varian V73/75 (minicomputer) and a DEC VAX 11/780, and programs are written entirely in FORTRAN. The model operates as an all-in-core model with no overlays.

Documentation of JANUS Model exists for the Varian Computer version; however, enhancements over the past several years have not been documented.

3.1.3.4 Model Evaluation -

The JANUS model is evaluated in terms of criteria established in Table 7, as follows.

3.1.3.4.1 General Evaluation -

The events and phenomena within JANUS are structured and coded separately; however, they execute interactively. It appears that existing modules may be modified and new modules added with relative ease. Documentation is outdated and sketchy at best. The model proponent, Lawrence Livermore National Laboratory, maintains the model, and the model has been modified on a number of

occasions to meet specific analytical requirements. While the proponent retains a staff to operate and maintain the model, the degree to which the laboratory is interested in the use of its model for command group training and is willing to contribute to such use cannot be assessed.

Scenarios may be generated with ease and can be modified dynamically during game play. An extensive data base is required; however, the data preparation time and effort is not known.

JANUS is a gaming model and must be played by opposing sides. As such, it accepts inputs from gamers on both sides with ease, and is very user friendly. Its use by a controller staff engaged in role playing would appear to be difficult and impractical.

The JANUS Model appears to be very acceptable to the Army for the purpose for which intended; namely, analytical purposes. As the model is expanded and as gaming staffs become larger, training in decision making would be a great benefit in exercising the game. For command group training, per se, it would appear to have limited value in its current operating configuration.

The model runs in simulated real time for periods of up to four hours.

3.1.3.4.2 System and Measurement Models -

JANUS simulates high intensity combat at brigade level (division and corps level planned) based on aggregation of item level systems. Simulation of activities is event-sequenced, and combat and limited combat support operations are simulated. Command and control and combat service support are not simulated but are gamer input. Additionally, close air support is not simulated.

3.1.3.4.3 Data Interpretation Models -

JANUS portrays battle events reasonably and realistically, and the battle data are displayed graphically for rapid assessment of the situation and tactical decision making by the gamers.

3.1.3.4.4 Control Models -

There is no command and control module in the JANUS Model, and all such functions are portrayed by human players. Corps and division staff functions are not separately portrayed.

3.1.4 MTM (McClintic Theater Model)

3.1.4.1 General Descriptions -

The McClintic Theater Model (MTM) was developed at the Army War College for use by student officers. It is an interactive wargame with both RED and BLUE sides represented by players. The original model has been extensively modified and enhanced by VII (US) Corps and has been used to drive corps CPXs. In this configuration, the model supports a maximum of 42 terminals (any mix of RED/BLUE/CONTROL) with a minimum of two terminals required, one master control and one for model play. This section addresses the VII Corps version of MTM.

Some important features of MTM are:

- Easy to Use (Free-Form Keyword Inputs)
- Input Checking/Verification
- Variable-Size Hexagonal Grid Terrain
- Applicable to Any Part of the World
- Easy to Modify (Top-Down Structured Program)
- Restart Capability
- Multiterminal Operation
- Manual Simulation of External Events
- Compatible with Graphics Hardware
- Time Driven (Not Red/Blue Turns)

3.1.4.2 Functional Description -

MTM was initially designed for use by students of the Army War College. Support was not available to furnish terminal operators and time was not available for extensive training prior to student use. A free form keyword input scheme was used to satisfy these qualifications. The order of input and spacing is not important. The machine simply

searches for a keyword it recognizes and the input variable for that keyword. Errors do not cause the game to stop. Invalid orders, such as trying to move an enemy unit, or orders with incorrect syntax are not accepted for use by the model; they are displayed with a message to indicate the problem and request for reinput. Orders are assumed to be effective immediately unless a start time is specified on the input. Orders will be held by the model and released at the appropriate time. Only one order may be executed by a unit at any instant in time and should multiple orders for a specific time be received by a unit, the last received order will be executed.

The control subroutine, available only to controllers, allows the modification of any of the game parameters. This allows the simulations of any effects not handled by the model. Any data; units, weather, game speed, etc., may be changed thereby allowing full control of the game by controllers.

Terrain is represented in MTM as a grid of hexagons. General properties within each hexagon are described by input of basic trafficability. Factors are input to specify the change of trafficability due to mountains, forests, cities, or barriers. Up to nine types of barriers may be defined by the input. Roads are treated as a barrier which speed movement rather than slow it. The current version allows the use of an area 190 by 105 hexagons. This has been applied by VII Corps at a map scale of 1:100,000 to represent an area approximately 500 X 400 kilometers.

Combat engagements occur when units are in adjacent hexes. Attrition is assessed by equations based on Lancaster's Square Law and using Weapon Effectiveness Index/ Weighted Unit Value scores for measures of combat power. The model data base can contain up to 100 weapon types, any unit may contain ten separate weapon types. Attrition is calculated for each weapon type in a unit and the unit's combat power is obtained from the sum of the WEI's of weapons available to the unit at that time. Weapons must have crews available to be counted as effective.

The model will handle a maximum of 999 units. Units may contain personnel in up to 25 specific MOS categories in addition to other "support" personnel. Crew requirements are tracked by MOS and a minimum crew must be available for each weapon before it is included in the unit combat power score.

Minefields and delays for clearing of minefields are played by MTM. Mines may be delivered by air, artillery, or by ground units which are not engaged.

Close air support (CAS), interdiction, air base attack, and reconnaissance missions are specified with a primary and alternate target hex. Reconnaissance flights may directly generate orders to CAS flights for targets detected between primary and alternate target hexes. Attrition by air is based on an input factor per sortie and is applied to any unit in the target hex.

Air defense is modeled using an input probability of kill for any overflight. Air defense assets are assigned saturation values so that a limited number of aircraft are engaged. Air routes may be assigned to air missions to avoid known air defense concentrations. Up to 20 specified air routes may be specified by each side and may be redefined as desired during the course of the simulation. Low level flight may also be used by air missions to reduce the probability of kill by air defense.

Artillery fire from Army and Navy guns is simulated. Mission orders specify the target hex, number of volleys, and start time. Ammunition availability and maximum range of the firing unit is considered by the model in executing fire missions. Attrition due to artillery fire is based on input factors which are applied to each unit in the target hex on a per volley basis.

Electronic warfare is represented very roughly by simply not transmitting orders to the unit. The percent of orders which will be lost is established by input for each side. Controllers may change these factors at any time during the simulation. When an order is lost the player is not informed and will know only when the order fails to be executed.

Intelligence sources represented in MTM are: HUMINT, satellites, enemy contact and aircraft overflights. HUMINT missions can be ordered by the commander for any specified hex. Information on enemy activities in that hex is then provided to the player after a time delay. Satellite data is automatically provided based on input parameters. Controllers may change the parameters during the game to simulate gaining or losing satellite capabilities. Input parameters establish a probability of detection for all aircraft missions for the detection of units in any hex that is overflown.

Consumption (or loss) and resupply is tracked for personnel by MOS (maximum of 25 separate MOS's in a unit), weapons of 100 types (maximum of 10 separate types in a unit), and logistics of ammunition and POL. Twenty-four categories are available for AMMO and POL including five Air Force ordnance loads and various artillery ammunition types.

The logistical categories tracked by the simulation are:

Class III	Diesel JP4	Mogas
Class V	Tank Main Gun Dragon Tow (Ground) Tow (Air) Lance Hawk Chaparral 155 HE	155 ICM 155 RAP 155 DPICM 155 FASCAM-SD 155 FASCAM-LD 8 INCH HE 8 INCH ICM 8 INCH RAP
Air Force Bomb Loads	Cluster Bombs G.P. Bombs Smart Munitions	Rockets Bullets

Unit availability of ammunition and POL is considered in all activities of the unit. Engaged ground units which run out of ammunition are annihilated. If they run out of POL they are assessed 50% attrition. Air missions cannot be flown without POL or ammunition and artillery missions will fire until ammunition is exhausted.

3.1.4.3 System Description -

The VII Corps version of MTM runs on a Wang VS100 with two 75 megabyte disks and will support up to 42 player/controller terminals. The program is top-down structured and highly modular allowing modifications to be made rather easily.

An input data base may be created or modified using a support program consisting of 29 subroutines. This program guides the user through the creation/modification of the starting data base in a simple step-by-step manner.

The MTM simulation consists of the main program and 84 subroutines. Player/ controller interface with the MTM model are handled by specific programs communicating through disk files.

3.1.4.4 Model Evaluation -

3.1.4.4.1 General Acceptability -

MTM appears to be relatively easy to use with the basic input data base preparation being guided by the support program and simple order formats for players to use during the game. The basic design of the model supports a commander playing each side. VII Corps has extended this to multiple commanders, subordinate to the Corps, who control specified units of that side. The amount of data and level of detail available to these players does not seem sufficient to load an entire corps staff; however, it has been used for that purpose.

The model is highly structured and modular lending itself to easy modification. Documentation seems adequate to obtain a full and complete understanding in relatively short order.

3.1.4.4.2 System and Measurement Models -

VII Corps experience indicates that model outputs are generally credible. The model contains representation of most of the major events of interest. Some of these are extremely limited, and most of the events and phenomena are modeled very simplistically. This simplistic treatment makes for easy understanding of the model but very greatly limits the accuracy of portrayal.

3.1.4.4.3 Data Interpretation Models -

The simplistic treatments of certain phenomena require simplistic data inputs. These are generally not very realistic due to the many phenomena or events which cannot be accounted for or represented by gross data.

3.1.4.4.4 Control Models -

The players and controllers control the conduct of the MTM simulation. Controller personnel can change any parameter in the game. This allows for the simulation of events not modeled in MTM or for the imposition of unexpected events. The players control the units through mission orders and the resupply of personnel, weapons, and

logistics (ammo and POL).

3.1.5 Simulation of Tactical Alternative Responses (STAR)

3.1.5.1 General Description -

STAR is a brigade level combat model in which all systems are represented at the individual weapon level. It is a closed, stochastic, high resolution, simulation model of two-sided combined arms air land combat. The original work (1978-1980) was done primarily by students at the Naval Postgraduate School (NPS) with assistance from faculty members. In July, 1980, responsibility for the model development was assumed by the TRADOC Research Element, Monterey. The ultimate goal of STAR is to simulate the combined arms battle at the brigade level on realistic terrain using individual tank, infantryman, field artillery piece, attack helicopter, and other individual systems as the entities modeled.

3.1.5.2 Functional Description -

STAR provides a detailed treatment of the individual weapon system engagements in a brigade-size force. The individual weapons are related by an established command hierarchy of squad, platoon, company, battalion, and brigade. Target coordination and handoff is handled at the squad, platoon, and company level. Maneuver coordination and decision is handled at the company, battalion, and brigade levels.

Terrain can be represented in digital form or by a continuous, functional representation developed at NPS. Line of sight between each observer-target pair is explicitly considered in STAR. Weather is reflected only as a background effect on visibility. Smoke from artillery and mortars and smoke munitions is explicitly modeled to include dispersion with time and wind. Smoke limits visibility and may affect sensor choice and search behavior.

Close air support and artillery fires are modeled. These may be either preplanned missions established by input or requests generated by engagements.

Intelligence is limited to the target acquisition by each weapon system. Detected target lists are maintained

for each weapon system and are aggregated at company level for use in movement decisions.

Logistic play is limited to ammunition accounting. Each weapon system has an initial supply and its available ammunition reflects each shot fired. There is no resupply.

Chemical and nuclear munitions are not considered.

3.1.5.3 System Description -

STAR is written entirely in the SIMSCRIPT II.5 computer simulation language. It operates as an all-in-core model. Disk data files are read during initialization only, with all required data being held in core. Output data files are created to contain detail and summary output from each run. The model is a complex, high resolution model with many details not found in other models. The potential user should not expect modification for this model to be trivial. Combat and combat support units and functions are modeled, but presently the combat service support play is very limited. STAR is a closed simulation model. It does not have the capability to stop during execution and then restart with changed data, or to interact with users in "real time". The period modeled typically may begin with preplanned indirect fire and continue through the several phases of the direct fire battle. Maximum duration is typically a few hours of simulated combat. The model is currently operational on IBM 3033, VAX 11/780, and UNIVAC 1100 computers.

3.1.5.4 Model Evaluation -

3.1.5.4.1 General Acceptability -

STAR is a very high resolution simulation of the interaction of the individual weapons of two opposing forces. Other actions which must take place to support this engagement of weapons receive only limited treatment. The model is very complex and would not be easy to modify. The model is under continuous development, and documentation of any existing version is not complete. The high level of detail required by the model requires extensive work in development and compilation of the input data for a simulation.

3.1.5.4.2 System and Measurement Models -

The extreme detail of modeling in STAR is an attempt to accurately represent the physical occurrences on the battlefield and, therefore, portray realistic outcomes for the engagement of two forces. The complexity of this detailed model makes cause and effect relations for any specific event rather difficult to trace. Most processes are stochastic which results in variation of outcomes using the same data.

3.1.5.4.3 Data Interpretation Models -

STAR requires highly detailed input data for its representation of individual weapon engagements. It provides outputs useful for the analysis of the small unit battle and the examination of results produced by variations in tactics, doctrine, and hardware. It has only limited treatment of higher level functions which require the attention of division or corps staffs and would require extensive expansion to include these functions.

3.1.5.4.4 Control Models -

STAR is a closed simulation. All data must be prepared and entered prior to starting the simulation. Command coordination is simulated in target selection. Command decisions are simulated by decision algorithms based on input threshold values.

3.1.6 TACSIM

3.1.6.1 General Description -

TACSIM is a one-sided interactive, stochastic, high resolution simulation model of U.S. intelligence collection sensor systems observing the enemy theater level force array. TACSIM provides controller mechanisms, intelligence output reports, and a combat scenario environment for simulating intelligence processes to stimulate the command decision making processes. TACSIM models a variety of reconnaissance, surveillance, target acquisition, and electronic warfare assets as they are tasked against the time-phased events of enemy movement and

electromagnetic operations on the battlefield and provides Intelligence and Electronic Warfare (IEW) reports to the command and control elements.

3.1.6.2 Functional Description -

TACSIM is a simulation of intelligence data collection efforts of U.S. assets against a specified enemy force. It does not model the combat of two opposing forces. The threat force and the movement profiles of major elements are input by the user. Mission assignments for all friendly intelligence assets are also input by the user. The results of missions are output to the command and control elements to exercise the fusion, correlation, and dissemination of intelligence data. The logistics aspects are not considered by the model. Attrition of assets if not modeled, but scenario-determined changes in the threat force due to losses may be input.

3.1.6.3 System Description -

TACSIM is written in FORTRAN and runs on a VAX 11/780 using a PDP 11/70 as an output message handler. User interface is provided by TEKTRONIX 4027 and DEC VT100 terminals. TACSIM is generally used to simulate long periods of actions in a faster than real time mode. When used to support actual exercises of command and control elements it is run in real time.

3.1.6.4 Model Evaluations. -

3.1.6.4.1 General Acceptability -

TACSIM does not model the full range of combat activities necessary for a division/corps staff exercise and should not be considered as a candidate for a training simulation. It does provide a good simulation of the intelligence gathering aspects needed to exercise the intelligence staff and should be considered a possible module within a training simulation system.

3.1.6.4.2 System and Measurement Models -

TACSIM explicitly models the ELINT, COMINT, and IMINT assets of the U.S. force. The use of TACSIM as a module of a division/corps training simulation system would require linking of TACSIM to the combat simulation to provide information relevant to that situation and to reflect the ability of threat forces to attrite the intelligence assets. Logistics aspects of supporting these assets would also have to be included. The degree of difficulty to accomplish this cannot be estimated at this time.

3.1.6.4.3 Data Interpretation Models -

TACSIM currently provides output reports in a form suitable for direct input to intelligence personnel. These reports provide the raw data for the exercise of the fusion and correlation functions of the staff.

3.1.6.4.4 Control Models -

Control of TACSIM is exercised by the user. All mission assignments of intelligence assets are specified by user input. Threat force locations and movements are also input. If used in a training system the threat force activities would have to be derived from the combat simulation portion of the system.

3.1.7 VECTOR-3 Model

3.1.7.1 General Description -

The VECTOR-3 model is a deterministic computer simulation of conventional, mid-intensity combat at theater level. The simulation does not require human intervention other than to provide initial inputs. Although designed as a theater-level model, VECTOR-3 can be used to simulate combat at corps and division levels. The level of resolution for theater simulations is battalion, while company level resolution is used for corps simulations.

The overall concept of combat played using VECTOR-3 (Figure 20)

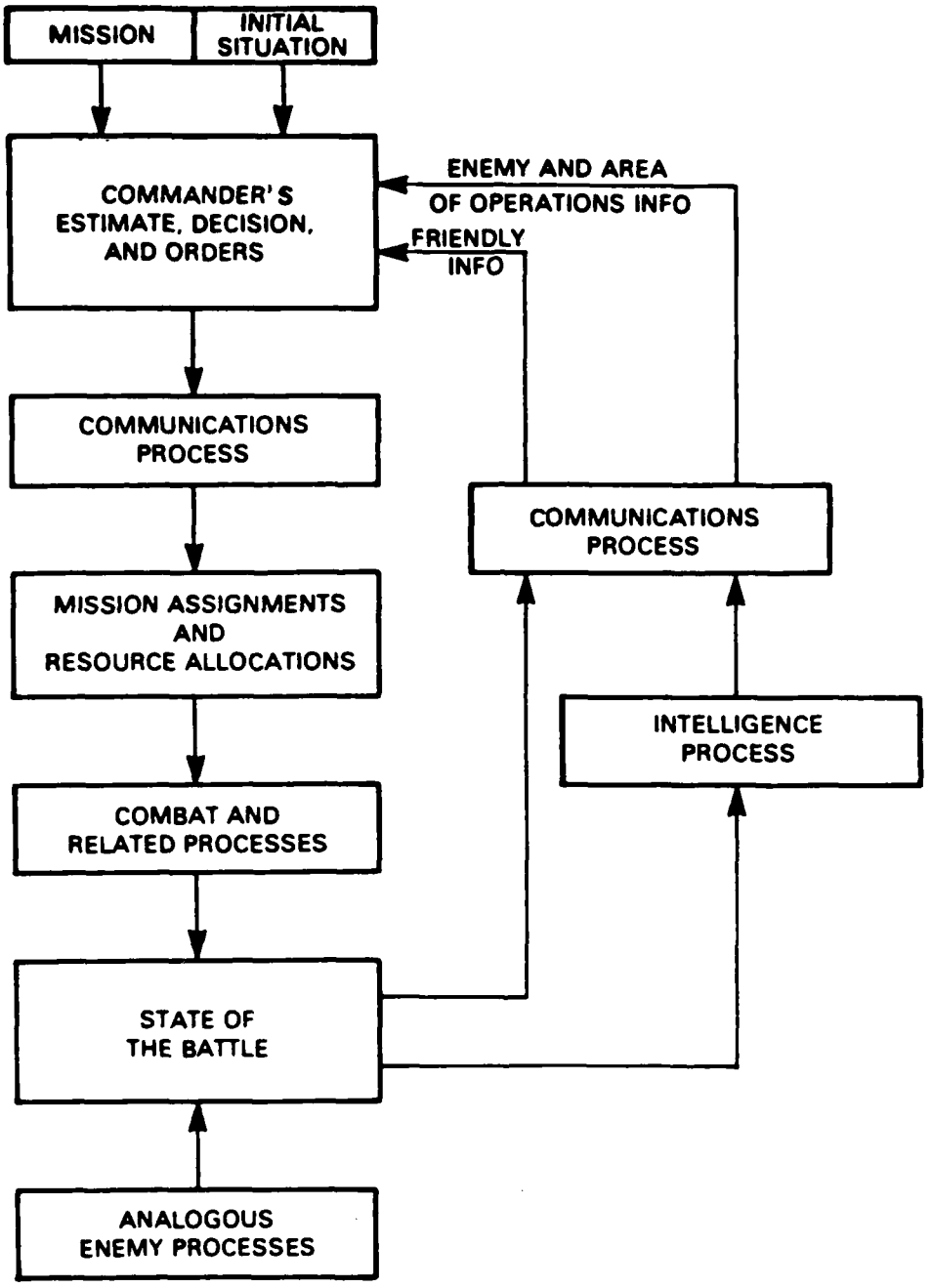


Figure 20. VECTOR-3 concept.

provides for the commander (theater or corps) to be given a mission, a situation, and resources to accomplish the mission. The commander performs an estimate of the situation, makes a decision, develops missions to subordinates, and allocates resources for mission accomplishment. Missions, resource allocations, and tactical decision rules are then input to VECTOR-3. The missions and other information are communicated (degraded by simulated battlefield delays) to subordinates where they are executed to produce a new situation. The new situation and intelligence gathered are communicated back to the commander who then makes new decisions to accomplish the mission.

From a model operation standpoint, firepower process models simulate weapon system-on-system effects, and attrition is assessed by the solution of equations containing such variables as types of target acquisition employed, target priorities, target behavior, and weapon performance characteristics. Command and control processes of subordinate units are represented at a level of detail specified by the user through tactical decision rules. Delays attributable to communications are assessed and influence the timing of events. Weather and terrain explicitly influence movement times. Outputs of simulation results are specified by the user and may be changed after each iteration (appropriate time-step).

3.1.7.2 Functional Description -

VECTOR-3 consists of a main battle simulation program and five supporting or service modules (Figure 21). The VECTOR-3 model performs the actual combat simulation. The Data Preprocessor is used to assist in the preparation of a portion of the input data for the VECTOR-3 model. The Binary Formatter transforms most VECTOR-3 inputs into binary format for efficient processing. The Post Processor outputs user-selected summary tables of theater-level combat results and detailed tables of combat results for each sector of the theater. The Air Post Processor performs the same functions as the Post Processor but concentrates on air-related activities.

The main battle simulation program of VECTOR-3 simulates combat interactions between opposing forces and consists of the following six process modules:

- Firepower processes which simulate the different mechanisms for delivering firepower and the effects of these firepower processes on force composition,

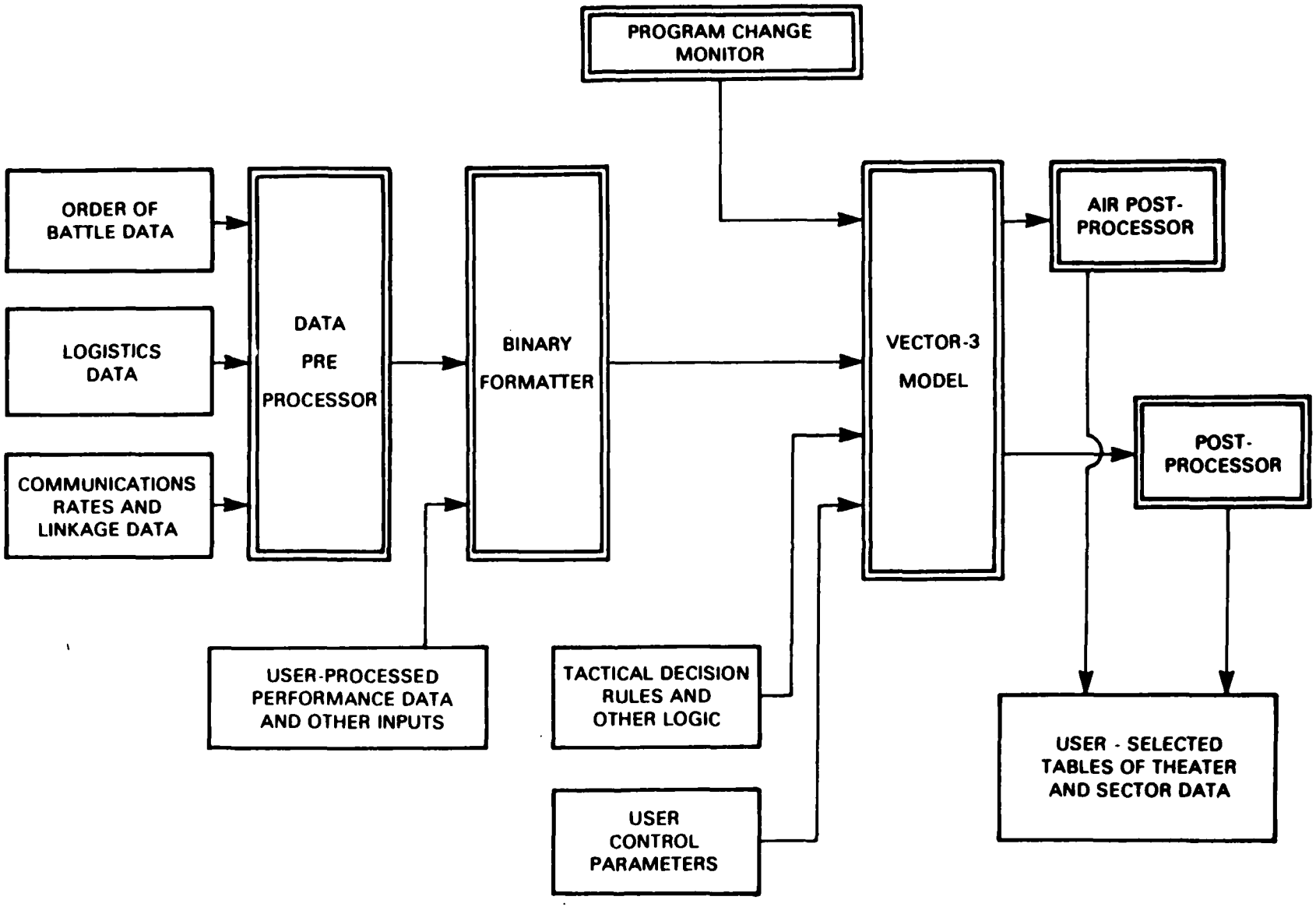


Figure 21. Summary flow chart of VECTOR-3 system.

supply levels, and the inventories of other targets. Specific firepower processes included are ground-to-ground, air-to-ground, ground-to-air, and air-to-air.

- Command and control processes which simulate tactical decision making at all command levels from theater down to battalion. A structure is provided in which the user inputs appropriate tactical decision rules that describe behavioral and decision processes which are an integral part of military activity.

- Intelligence and target acquisition processes which represent the acquisition of weather information, acquisition of ground and air targets for decision making and engagement, and the collection of air and ground order of battle.

- Communications processes which simulate the transmission of intelligence, command, and combat information throughout the command hierarchy. The effects of communications processes are represented by the expected value of delays incurred in transmitting messages.

- Logistics processes include the simulation of the consumption of supplies and the replacement of personnel and materiel that are destroyed or consumed during the campaign. As weapons systems, target acquisition resources, ammunition, POL, other supplies, and personnel are attrited or consumed, they are replaced from available resources in accordance with user-supplied tactical decision rules.

- Movement processes represent air flight and maneuver unit movement. Movement is

governed by tactical decision rules, possibly delayed by communications and decision lags.

3.1.7.3 System Description -

The programs in VECTOR-3 are written entirely in FORTRAN and execute on one of the following computer systems:

Honeywell H6000 (Command and Control Technical Center)

Amdahl 470 V/b (Vector Research, Incorporated)

UNIVAC 1170 (US Army TRASANA)

No special purpose equipment is required in any of the operating configurations.

3.1.7.4 Model Evaluation -

VECTOR-3 is evaluated in terms of criteria established in Table 7 as follows.

3.1.7.4.1 General Acceptability -

VECTOR-3 well simulates deterministically the battle events and phenomena which occur at theater and/or corps level. Key combat activities are modeled independently yet operate interactively in a highly realistic battlefield simulation. Documentation of VECTOR-2 (1981 plus), the immediate predecessor of VECTOR-3, is of exceptionally high quality, and the VECTOR-3 documentation now is progress can be confidently assumed to be of equally high quality.

Scenarios and data bases at theater level have been prepared by CCTC, VRI, and TRASANA, and it is estimated that at least six man-months of effort are required to acquire base data and to structure it in model format. Extensive effort would appear necessary to permit VECTOR-3 to be used to support role playing by either a

division/corps staff or by controller staffs; i.e., to permit and support human intervention.

For typical games, the model requires approximately 11 seconds of CPU time per combat day. The time required to analyze and evaluate results, when run in its present configuration, is dependent upon the range and depth of analysis required by the user; however, the level of detail available in the output facilitates effective analysis and evaluation.

VECTOR-2, the predecessor of VECTOR-3, is rather well accepted and widely used by the community at large. Present users include the Command and Control Technical Center, the US Army Concepts Analysis Agency, the Institute for Defense Analyses, the SHAPE Technical Center, Vought Aircraft (Dallas, Texas), and US Army TRADOC Systems Analysis Activity (TRASANA). The model is Government property having been delivered by Vector Research, Inc., in 1981 (VECTOR-2), and VECTOR-3 will be similarly delivered. Future costs for development would be minimal, but costs to adapt VECTOR-3 for desired role playing should be anticipated as extensive. VECTOR-3 is expected to be maintained at both VRI and TRASANA.

3.1.7.4.2 System and Measurement Models -

Each of the six process models in VECTOR-3 appears to represent the functions simulated with highly credible results. The simulation results are output in accordance with user-specified format for effective and meaningful interpretation. Current outputs are quite ample to support analysis and evaluation of nonnuclear warfare for use in net assessments, for performing force deployment studies, and for generating information for performing trade-offs among weapon systems.

3.1.7.4.3 Data Interpretation Models -

The data reduction and interpretation tables inherent to VECTOR-3 were designed primarily for analytical purposes; however, the same models must be significantly modified to support role playing by players and controllers. A considerable number of intermediate models and routines would appear to be necessary of development to support the latter objective.

3.1.7.4.4 Control Models -

Given a complete set of tactical decision rules, the command and control processs in VECTOR-3 are effectively and realistically simulated at echelons below theater level; however, the model does not address staff functional activities at any level in the command hierarchy.

3.1.8 Model Review Summary

Tables 8 and 9 provide summary comparison charts for the models reviewed above. Table 8 is a comparison of general characteristics of each model. Table 9 provides a comparision of the model representation of the functional areas noted in paragraph 2.3. These comparisons and the following evaluation form the basis for the short-term development approach, Chapter 4.

3.2 MODEL COMPARATIVE EVALUATION

Table 10 provides a comparative evaluation, of the models reviewed against the criteria which were defined in Table 7. These evaluations are highly subjective and have been applied to the model in its current form as it meets the needs of the defined training system. Each of the models was evaluated on a scale of 1 to 10. These ratings were then weighted according to the importance of each criterion to the training system using a simple weighting of 3 for high importance, 2 for medium, and 1 for low importance.

As noted above, the evaluations are based on the current model configuration and its ability to meet the criteria. The ratings therefore provide an indication of the effort required to convert each to meet the criteria. Chapter 4 provides a separate assessment of the effort required but in terms of meeting the specific training system requirements established in Chapter 2. Table 10 provides the individual ratings, a total raw score, a weighted score reflecting the criteria importance, and a normalized weighted score. these results give an order of preference as follows: ARTBASS, MTM, JANUS, TACSIM, VECTOR, FOURCE, and STAR.

This evaluation provides one of many ways to compare the models. The individual ratings are subjective since no good measurement exists for most of the criteria

and, although weighted by a gross measure of importance, failure to satisfy certain criteria could be sufficient cause for elimination. Conversely, high satisfaction of certain criteria might justify higher rating of that model. Chapter 4 provides additional means for selection of a model as the basis for a short-term development approach.

Table 8. Comparison of model general characteristics.

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
Form Man-Machine Interface	Interactive Supports role playing sub-ordinates	Closed Pre-run input Post-run analysis	Interactive Force commanders Blue & Red are game control	Interactive Force or sub-ordinate level commanders Blue & Red are players controllers also interact either side	Closed Pre-run input Post-run analysis	Interactive Intel. activities assign missions and receive out put data, mission results	Closed Pre-run input Post-run analysis
Simulation Level	Battalion	Division	Brigade	Theater/Corps	Brigade	Theater	Theater
Force Resolution	Platoon	Battalion	Elements (ind to Company)	Battalion	Individual	US Intel assets (sensors) Threat division & sub elements	Battalion
Terrain Resolution	25X25m digitized	1X3km	25X25m digitized	Variable size hexagonal sectors represented as to trafficability	Digitized or continuous functional representation Explicit LOS computation for each obs-tgt pair	None-spatial representation only	36 types (6 intervisibility, 6 trafficability levels) variable size arenas appro 8m frontage
Outcomes	Stochastic	Deterministic	Stochastic	Stochastic	Stochastic	Stochastic	Deterministic
Scenarios	Defend, Attack, Retrograde	Defend	Gamer Controlled	Player Controlled	Input Determined	Threat posture & distribution are input	Input Determined
Run Time - Simulated: Real	1:1	~16:1	~1:1	Determined by controller 1:1 or faster		1:1 or faster	~200:1
Language	FORTRAN	FORTRAN	FORTRAN	FORTRAN (primary) COBOL (file manipulation)	SIMSCRIPT II.5	FORTRAN	FORTRAN
Hardware	Perkin-Elmer (mobile van)	UNIVAC 1100/82	VAX 11/780, Varian mini	WANG VS100	UNIVAC 1100/82 VAX 11/780 IBM 3033	VAX 11/780 W/PDP 11/70 output control	UNIVAC 1100/82

Table 8. Comparison of model general characteristics (continued).

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
Primary Use	On staff training	C³ Analysis	Force commander training nuclear battlefield analysis	Commander training	Tactics, doctrine, & hardware analysis	Intel staff training	Force Analysis
Input Requirements Prior To Run	Extensive	Extensive	Extensive	Extensive	Extensive	Threat force locations and movements, sensor capability data, deployment templates	Extensive
During Run	Orders to simulated units	NA	Orders to simulated units	Orders to simulated units and resupply of units	NA	Intel mission assignments changes to threat force as determined by scenario	NA
Output Character	Tabular & Graphic	Tabular	Graphic	Tabular reports	Tabular	Report Forms	Tabular
Output Interpretation Rqm'ts	Simple	Detailed analysis	Simple	Simple	Detailed Analysis	Purpose is raw data for fusion and correlation	Detailed analysis

Table 9. Comparison of model functions representations.

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
FORCE CONTROL							
Command & Control	Players input unit orders	Staff processes are modeled	Force cmdrs (Blue and Red) are the gamers	Force cmdr or subordinate cmdrs are players	Simulates tgt hand off coordination and maneuver decisions uses priorities & threshold inputs	User inputs mission orders for intel assets	Simulated thru tactical decision rules and input mission & resource allocations
Communications	Players to controllers and controllers to players	Modeled by delays of orders and reports	Gamer to model	Player to model	FM nets for manauver and fire support are modeled	Threat force comm nets are simulated for detection, sensor report delays	Simulated in model; degraded realistically
MANEUVER FORCES							
Resolution	Platoon	Battalion	Item level to Co size elements	Battalion	Individual weapon system	Threat division subelements, friendly sensor systems	Battalion
Type							
- Dismounted Inf	Yes	No	No	Yes	Yes	NA	Yes
- Mounted Inf	Yes	Yes	Yes	Yes	Yes	NA	Yes
- Armor/Anti-tank	Yes	Yes	Yes	Yes	Yes	NA	Yes
- Air Assault	No	No	No	No		NA	No
- Airborne	No	No	No	No	No	NA	No
- Atk Heli	Yes	Limited	Yes	Yes		NA	Yes
- Cavalry	Yes	No	No	Yes		NA	Yes
- Long Range Patrols	Yes	No	No	Yes	No	NA	No
Movement	Player controlled; model simulated	User controlled; model simulated	Gamer controlled	Player controlled	To contact input	Threat element movement profiles input, sensor movement input	In sector; no lateral movement; air and ground simulated.

Table 9. Comparison of model functions representations (continued).

Page 2

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
(MANEUVER FORCES)							
Maneuver	Yes	Yes	Yes. Controlled by gamer for maneuver & fire support units	Player controlled	Yes	NA	Yes
Conflict	Player input; conflict modeled by system-on-system assessments of direct fire and indirect fire	User inputs; engagements results calculated by differential equations and stochastic process	Gamer controlled; direct fire modeled; indirect fire by gamer input	Units in adjacent hexagons. Attrition by WEI/WUV score for grd cmbt. Air/arty attrite by input factor per sortie /volley	Individual shooter-target engagements any orientation. Detail LOS calculations. Detail physics of wpn-tgt interaction	NA	FEBA orientation; simulated using combat models-air-to-air, air-to-ground, ground-to-air, ground-to-ground
Reconnaissance	Yes (no current scenario for play)	No	No	Player receives recon and sensors reports	Ind wpn systems acquire targets w/avail sensors, aggregated at Co level	Force level sensor systems are modeled	Simulated as intelligence and target acquisitions
Security Operations	Yes (no current scenario for play)	No	No	No	Simulated by input unit orders, decision thresholds	NA	Integral to combat models.
FIRE SUPPORT							
Field Artillery	Yes (suppression only)	User input; arty units modeled to battery level	Yes	Modeled w/various ammo types, missions ordered by player	Preplanned (input) missions and engaged unit requests are modeled	NA	Integral to combat models.
Close Air Support	Yes	Limited Representation	Yes, helicopters only; no Air Force CAS	Modeled, player orders missions, choice of 5 ordnance loads	Same as FA	NA	Yes
Naval Gunfire	No	No	No	Modeled (See FA)		NA	No
NBC	Yes	No	Nuclear & Chem are modeled	Yes	No	NA	No

Table 9. Comparison of model functional representations (continued).

Page 3

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
(MANEUVER FORCES)							
Target Acquisition	Yes	Wide range of sensors E-O and radar are modeled	Visual sensors & limited model of counter battery radar	HUMINT, satellite aircraft, and enemy contacts provide tgt info	Wide range of sensors, E-O and radar are modeled	COMINT, ELINT, & IMINT systems are modeled	Yes
COMBAT ELECTRONIC WARFARE & INTELLIGENCE							
Integrated Intel	Controller input based upon model calculations of target acquisitions and intelligence	Sensor input to staff processes for correlation and merging is modeled	Limited intelligence must be acquired by visual or counter battery observations	Player responsibility	Acquired tgts are aggregated at Co level	Provides raw data to be used in integration by user	Order-of-battle only
Electronic Warfare	Jamming of friendly comm by controllers	Red against Blue is simulated	None	Simulated thru loss of input orders	Explicit model of jamming and DF	COMINT & ELINT against threat force emissions	Limited
Operations Security	No	No	No	No	No	NA	No
AIR DEFENSE							
Air Battle Management	Yes; air-to-ground and ground-to-air, no air-to-air	No	Air-to-air, air-to-ground (helicopters only)	No air-to-air, Prob of kill by AD input for each hex	AOA is simulated	No	Yes
Air Space Management	No	No	No	Air routes may be defined by players, low level flight may be ordered	No	No	No
COMBAT SERVICE SUPPORT							
Transporation	No	No	No	No	No	No	No

Table 9. Comparison of model functional representations (continued).

Page 4

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
(COMBAT SERVICE SUPPORT)							
Maintenance	No	No	No	No	No	No	No
Field Service	No	No	No	No	No	No	No
Supply	Yes, attrition, consumption, resupply, status	No	Gamer may input weapon replacements initial ammo is tracked for availability, no resupply	Resupply of ammo, POL and major wpns may be ordered by players	Initial ammo is tracked shot by shot, no resupply	No	Limited, no degradation except losses of prestock supplies. Replacement by tactical decision rules
Medical	No	No	No	No	No	No	No
Personnel Replacement	Yes	No	Gamer may input personnel replacements	Resupply of personnel by MOS may be ordered by players	No	No	Limited. Replacement by tactical decision rules.
ENGINEER							
Mobility	No	No	Function of terrain, not modeled otherwise	Simulated by controller input to establish roads or bridges, minefield clearance simulated by delay	Basic movement routes input, decision logic may choose alternate, mine field breaching is simulated	No	No
Countermobility	Mine fields are modeled obstacles and breaching is modeled	Mine field effects only	Mine fields and tank ditches are modeled; tree-blowdowns; rivers	Mine fields are modeled emplaced by grd unit, air or arty-bridges and roads destroyed by input order	Mine fields, tank ditches and water are modeled	No	Mine fields are modeled

Table 9. Comparison of model functional representations (continued).

Page 5

	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
(ENGINEER)							
Survivability	No	No	No	No	No	No	No
General Engineering	No	No	No	No	No	No	No
OTHER							
Weather (incl night)	Yes	No	Visibility levels may be input	Simulated by input probabilities for visibility changes	Represented only as an input variation of background visibility	Modeled only as random degradation of sensor capability	Yes
Obscurants (smoke, etc.)	Yes	No	Smoke effects are dynamically modeled	No	Smoke effects are dynamically modeled	No	No

Table 10. Evaluation of existing simulations.

	IMPORTANCE WEIGHT		ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR
Part I: Criteria Applicable To The Model As A Whole									
MODIFIABILITY									
Modularity-1	3	9		5	4	7	4	4	7
Modularity-2	3	8		4	4	9	4	4	7
Adequacy of Documentation	3	10		9	3	5	3	5	9
Developer's Support and Sponsorship	1	10		5	6	8	4	7	9
EASE OF USE									
Ease of Scenario/Data Generation	2	8		6	8	8	5	6	3
Support of Role Players	3	10		0	8	8	0	8	0
Ease of Data Reduction and Interpretation	2	9		0	9	8	0	6	0
Friendliness of User Interface	2	9		5	9	9	5	9	5
AVAILABILITY									
Acceptability	3	10		6	7	9	5	8	8
Cost	2	9		9	9	9	9	9	9
RUNNING SPEED	3	10		10	10	10	10	10	10

Table 10. Evaluation of existing simulations (continued).

	IMPORTANCE WEIGHT	ARTBASS	FOURCE	JANUS	HTN	STAR	TACSIN	VECTOR
Part II: Criteria Applicable To The System And Measurement Submodels								
Credibility	3	8	8	8	8	8	8	8
Adequacy	3	6	3	4	6	8	1	5
Accuracy	1	8	3	6	2	9	3	7
Understandability	2	8	7	7	9	5	7	5
Variety	2	8	0	8	8	8	8	8
Part III: Criteria Applicable To The Data Interpretation Submodels								
Credibility	3	8	8	8	8	8	8	8
Adequacy	3	8	5	9	7	4	3	4
Part IV: Criteria Applicable To The Control Submodels								
Applicability	3	8	6	6	7	5	5	6
Raw Value		164	99	131	145	102	119	110
Importance - Weight Score		405	254	325	364	248	292	276
- Normalized		1.00	0.63	0.80	0.90	0.61	0.72	0.68

Legend:

Model Rating for Each Criterion
0 = No Degree Of Satisfaction
10 = High Degree Of Satisfaction

Importance of Criterion
High = 3
Med = 2
Low = 1

SECTION 4

SHORT-TERM DEVELOPMENT APPROACH

The requirements and concept for the development of a division/corps training simulation have been identified and discussed in Chapter 2. The concept for such a training simulation addresses the training of division and corps command groups independently as well as the training of several of the command groups in concert using a common scenario. The translation of the total concept into reality involves extensive resources and time, up to six years. In realization of this fact, the US Army desires that a short-term training simulation capability be developed and fielded within a period of approximately two years and that such a short-term solution be an interim capability until the longer term capability can be developed.

The paragraphs which follow will, first, define and evaluate the subset and overall division/corps training simulation requirements which can reasonably be satisfied in the short-term period. Next, based upon the short-term requirements and using the descriptions and evaluations of selected simulations/models from Chapter 3, a model will be selected which can best be adapted to meet the short-term requirements. Finally, a development approach will be offered which may be implemented to translate the selected model into the desired short-term training simulation capability.

4.1 IDENTIFICATION OF SHORT-TERM SIMULATION REQUIREMENTS

The concept and requirements for a division/corps training simulation have been described in Chapter 2 and are summarized in Table 11. From the review, evaluation, and comparison of models in Chapter 3, it is apparent that no capability currently exists within the evaluated models that will satisfy all of the requirements nor can sufficient modifications to and upgrades of the models be performed over the two-year short-term period so as to

Table 11. Summary of division/corps training simulation requirements.

DIVISION/CORPS TRAINING SIMULATION REQUIREMENTS	NEED FOR SHORT TERM CAPABILITY		
	ESSENTIAL	PARTIAL	DEFERRED
1. Support command group training in a realistic operational environment.			
a. Train division and corps command groups concurrently as well as independently		X	
b. Train command group as an integrated force management team	X		
c. Train general staff sections independently in their functional roles			X
d. Use organic systems, equipment, and procedures support training	X		
e. Support training under simulated combat conditions	X		
2. Support command group training through a systematized approach.			
a. Represent all battle field functions and conditions		X	
b. Support role playing of command groups/ units external to the training audience	X		
c. Permit two-sided free play of simulated combat, combat support, and combat service support operations	X		
d. Provide flexibility and continuity of training by a capability to interrupt, freeze, and restart training as well as to replay the training scenario	X		
e. Provide rapid feedback to the training audience	X		

achieve the total required training simulation capabilities. In order to achieve a short-term capability, therefore, it is necessary to defer some requirements or parts of requirements, for achievement during the long-term period (two to six years). Those requirements which should be included, in whole or in part, in the development of the short-term training simulation are included in Table 11. Also included in this table are those requirements which can be deferred to the long-term to increase the opportunity for success in the short-term effort. This approach lends itself to the building block concept set forth in Chapter 2. Once a short-term training simulation capability is achieved, incremental upgrades of that capability may be effected as a means to satisfy the long term requirements.

An ultimate requirement of the training simulation is to train the division and corps command groups concurrently using a common scenario. Inherent to this requirement is the capability of training the corps and division command groups independently. An initial step, and therefore a building block, is to develop a simulation system to train the division command group independently, and this capability has a high probability of achievement in the short-term period. The extrapolation of the short-term capability to permit the training independently of a corps command group can be accomplished during the development of the long-term capability as can the capability for training concurrently the corps and division command groups.

The training of the command group as a team takes on greater importance than the functional training of each coordinating (general) staff section. Participation of the entire command group in a training simulation exercise will immediately identify shortfalls in training of the individual staff sections; however, until a training simulation capability can be developed to accommodate functional training of each general staff section, such training can be conducted off-line by standard training procedures. It is anticipated that a training simulation capability for functional staff training of each general staff section can be achieved early in the long-term period.

The building block approach to development of the division/corps training simulation can be summarized as follows in terms of the training configuration:

1. Division Command Group (short-term).
2. Corps Command Group
3. Combined Division/Corps Command Groups
4. Individual Division Staff Section.
5. Individual Corps Staff Section.

It is essential that the training system incorporate the use of systems, equipment, and procedures which are organic and extant in the headquarters of the command group and that the simulation be exercised in a field, or simulated field, environment. The exercise of the training simulation under any other conditions would detract unnecessarily from the realism of the training.

The training simulation must be capable of representing major battlefield activities sufficiently to simulate realistic training on the part of all general staff sections. This capability is achieved for the short-term capability through a careful selection of combat, combat support, and combat service support operations to be represented or simulated. The full range of such operations will be added incrementally at a later date to achieve the long-term capability.

Support of role playing by controllers is an essential capability of both the short-term and long-term training simulations. Role playing substitutes realistically for units and/or staff sections not participating actively in the training exercise. Role players (controllers) also serve as interactors between the command group undergoing training and the battle model supporting the training simulation.

Free play of the training exercise by both the command group and the controller staff, representing friendly as well as enemy forces, must be inherent to the training simulation. Freedom of actions and decisions lends maximum credibility and objectivity to the training exercises.

Flexibility and continuity of training can be greatly enhanced by a capability of the training simulation to accommodate stopping exercise play, evaluating and critiquing the exercise, and subsequently restarting the exercise, taking full advantage of the critique in continuing exercise play. The capability for controllers to make limited data changes prior to restart is also desirable to provide a particular focus in the simulation. A similar capability to replay an exercise based upon differing information and decisions is highly desirable in the short-term development activities. Failure to include such a capability in the short-term capability will strongly inhibit the inclusion in the long-term capability.

The capstone of the training simulation is a capability of feedback to the command group regarding the quality of performance of the training. The command group, individually and collectively, needs to be made aware of the activities performed well, as well as those performed

poorly. Such feedback will provide the basis for future training as well as serve as an evaluation of operational capability and readiness to engage in actual combat operations.

Based upon the model descriptions presented in Chapter 3, each of the candidate simulation models is described (Table 12) in terms of the shortfalls that exist in meeting the short-term requirements. These shortfalls are expressed in qualitative terms, and the relative degree to which the models satisfy the training simulation requirements can be reasonably evaluated. The effort required to modify each candidate model to meet the short-term training simulation requirements is presented qualitatively in Table 13.

4.2 SHORT-TERM DEVELOPMENT STRATEGY

The basic strategy for developing a short-term division training simulation involves consideration of two basic factors: risk and cost. Elements of the two factors are listed below:

- Risk
  - Requirements achievability in the short-term
  - Necessity for research and development
  - Exceeding available resources
  - Visibility of development

- Cost
  - Development
  - Scenario/data base preparation
  - Operating

Accepting a minimum of risk in the development of the division training simulation translates into a high probability of achievement of the short-term capability. Limiting the short-term requirements to those identified in paragraph 4.1 above is a major step in reducing the risk to early achievement of the short-term capability. Basing the development of the short-term capability on a model that has numerous and significant shortfalls in current capability increases the risk in achieving the capability, particularly if the addition of new equipment and/or the addition or redesign of model algorithms requires research and development activity. Resources for development of the training simulation are not unlimited; therefore, the risk of requiring more resources than are planned and available

Table 12. Shortfalls in meeting short-term training simulation requirements.

SHORT TERM REQUIREMENT	CANDIDATE MODELS						
	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR-3
Train command groups at division level	Designed for bn; able to train brigade	No shortfall	Designed for brigade	Designed for theater/corps	Designed for brigade	Designed for theater/corps	Designed for theater/corps
Train command groups as integrated force management teams	No shortfall	No capability	Very limited capability	Limited capability	Very limited capability	Very limited capability	Very limited capability
Use organic systems, equipment & procedures	No shortfall	No capability	No capbility	Limited capability	No capability	Limited capability	No capability
Support training under simulated combat conditions	No shortfall	No capability	No capability	Limited capability	No capability	Limited capability	No capability
Represent necessary battlefield functions and conditions	Limited CSS, engineer, EW; no airspace mgmt.	Limited force representation, CAS; no NBC recce, airspace mgmt, air battle CSS, engineer, weather	Limited force representation, air battle mgmt, target acquisition, intelligence; no recce, CAS(AF), EW, airspace mgmt, CSS, engineer	Limited intelligence, artillery, EW, air defense, recce; engineer; no airspace mgmt CSS	Limited force representation, artillery, intelligence, air defense, engineer; no NBC, airspace mgmt, CSS, weather	Very limited force representation and maneuver; limited recce; target acquisition, weather; no artillery, CAS, NBC, air defense, airspace mgmt, CSS, engineer, combat model	Limited force representation movement, intelligence; no NBC, CSS, airspace mgmt, engineer
Support role playing	No shortfall	No capability	Supports gamers only, not role players	Supports gamers only, not role players	No capability	Limited capability	No capability
Permit two-sided free play	No shortfall	No capability	No shortfall	No shortfall	No capability	No capability	No capability
Provide flexibility and continuity of training (interrupt, freeze, restart, and replay)	No shortfall	No capability	Limited capability	No recovery or replay capability	No capability	No capability	No capability
Provide rapid feedback to training audience	Slight shortfall in completness	Slow; limited capability	Limited capability	Limited capability	Slow; limited capability	Slow; limited capability	Slow; limited capability

Table 13. Effort required to meet short-term requirements.

SHORT TERM REQUIREMENT	CANDIDATE MODELS						
	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR-3
Train command groups at division level	Moderate	Low	Moderate	Low	Moderate	Low	Low
Train command groups as integrated force management teams	Low	High	High	Moderate	High	High	High
Use organic systems, equipment, and procedures	Low	High	High	Moderate	High	High	High
Support training under simulated combat conditions	Low	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Represent necessary battlefield functions and conditions	Moderate	High	High	Moderate	High	High	Moderate
Support role playing	Low	High	Moderate	Moderate	High	High	High
Permit two-sided free play	Low	High	Low	Low	High	High	High
Provide flexibility and continuity of training (interrupt, freeze, restart, and replay)	Low	High	High	Moderate	High	High	High
Provide rapid feedback to training audience	Low	High	Moderate	Moderate	High	High	High

must be minimized. Early visibility into the operational configuration and use of the short-term capability will provide assurance that the desired long-term capability can be achieved; consequently, risks of not achieving an early visibility must be avoided. This early visibility can best be gained through the building block development approach. Such an approach produces operational versions of the training simulation throughout both the short-term and long-term development.

Of the cost considerations that affect achievement of the short-term capability, the development costs are the most important discriminant among the candidate models. Scenario and data base preparation costs are one-time costs incurred largely prior to operational use of the system; therefore, they do not constitute a major discriminant among candidate models. Similarly, operating costs of a system which meets the short-term requirements do not constitute a major discriminant among the candidate models.

A comparison of the risks and costs of using each of the candidate models as a base for developing a short-term training simulation is made in Table 14.

4.3 SELECTION OF A SHORT-TERM DEVELOPMENT APPROACH

The shortfalls of the models that are candidates for use as a baseline to develop the short-term capability (Table 12); the effort required to overcome the shortfalls (Table 13); and the risks and costs of adapting each model to meet the short-term requirements (Table 14) have all been considered in selecting a baseline model for development of the division training simulation. These considerations are arrayed in Table 15 for ease of comparison.

ARTBASS is the preferred choice as a baseline model due to the relative closest match to short-term requirements, as well as to the relatively low risk and cost of adapting the model to meet the requirements.

4.4 DEVELOPMENT APPROACH

The recommended approach to achieving a division training simulation capability in two years involves the following activities using the selected baseline training simulation, ARTBASS:

Table 14. Risk and cost considerations for short-term development.

DEVELOPMENT CONSIDERATIONS	CANDIDATE MODELS						
	ARTBASS	FOURCE	JAMUS	MTM	STAR	TACSIM	VECTOR-3
Risk							
. Requirements achievability in the short term	Low risk	High risk	Moderate risk	Moderate risk	High risk	High risk	High risk
. Necessity for research and development	Low risk	High risk	Moderate risk	Low risk	High risk	High risk	High risk
. Exceeding available resources	Low risk	High risk	High risk	Moderate risk	High risk	High risk	High risk
. Visibility of development plus early use	Low risk	High risk	Low risk	Low risk	High risk	Moderate risk	High risk
Cost							
. Development	Low cost	High cost	Moderate cost	Moderate cost	High cost	High cost	High cost
. Scenario/data base preparation	High cost	Moderate cost	High cost	High cost	Moderate cost	Moderate cost	Low cost
. Operating	Moderate cost	Moderate cost	Moderate cost	Moderate cost	Moderate cost	Moderate cost	Moderate cost

Table 15. Overall comparison of candidate models.

SHORT TERM DEVELOPMENT CONSIDERATIONS	CANDIDATE MODELS						
	ARTBASS	FOURCE	JANUS	MTM	STAR	TACSIM	VECTOR-3
Effort to overcome shortfalls	Low	High	High	Moderate	High	High	High
Risk	Low	High	Moderate	Moderate to Low	High	High	High
Cost	Low to Moderate	High	Moderate to High	Moderate	High	High	High

- Baseline modification
- Baseline enhancement
- System configuration design and implementation.

These activities are discussed in the following subparagraphs, as is the incremental approach to achieving the desired capability.

4.4.1 Baseline Modifications

Most of the modifications required to ARTBASS are needed to meet the requirement for a division-level simulation, which means that control and reporting of units should be aggregated at battalion level for combat units, and the equivalent level for noncombat units. These modifications can be categorized as follows:

- Division level data base
- Operational state processing
- Task organization
- Detections and engagements
- Terrain data base resolution
- Time-step control
- Environment representation
- Training feedback
- Alert aggregation

The general philosophy by which ARTBASS will provide division level simulation is that the controllers will role play brigades (and other units in direct communication with the division) and will control (and receive reports from) battalions being simulated. The ARTBASS model will perform detection, engagement, and other battlefield functions of company-level units. The control of companies subordinate to the battalions will be through battalion-level decision rules contained within the model. This approach will provide the advantage of easy and natural role playing by the controllers, and credible simulation of battlefield events using proven training simulation algorithms. More detail on this approach and other baseline modifications is provided in the following subparagraphs.

4.4.1.1 Division Level Data Base -

The scenario and simulation data bases will need to be expanded to accommodate the units of interest to the division. This will include eleven maneuver battalions and

their 55 organic companies. It is expected that a maximum of 65 combat support units and 15 combat service support units will be adequate to represent those functions at the division level. Thus, for blue forces, a simulation capability of 150 divisional units should be adequate. Experience has shown that an equivalent number of units will be needed to represent the opposing force. Allowing 50 units to simulate nondivisional units under operational control of the division, plus transitory activities, such as air strike and airlift missions, will put a total requirement on the system to simulate 350 units. This has more impact on the size of the system than on processing load, since many of the units will be stationary and not actively involved in battle at any given time.

Besides the number of units needed in the division level data base, the amount and mix of equipment types allowed within each unit should be increased. Also, some new unit types and equipment types will need to be defined, particularly for combat support and combat service support units.

4.4.1.2 Operational State Processing -

The decision rules that control automatic movement, detection, and engagement of units are termed "operational state processing" in the ARTBASS model. These rules will need some modification to accommodate differences in doctrine and activity of the larger units needed for division training.

4.4.1.3 Task Organization -

A task organization capability will need to be added to ARTBASS. This will serve two purposes; easy allocation of resources as directed by division or as determined necessary by the controllers, and easy control of maneuver battalions while still allowing modeling of company-level units. A battalion will have a location that represents the center of mass of all subordinate units, and a disposition (area occupied) that represents the relative dispersion and orientation of the subordinate units. The formation of the subordinate units will also be determined by the mission and movement of the battalion, and will be subject to the operational state processing rules discussed in paragraph 4.4.1.2.

4.4.1.4 Detections and Engagements -

The logic regarding detection and engagement of opposing units will need to be modified to accommodate the use of larger sized units. The modifications will involve simplifying the detailed logic currently used in ARTBASS, and changing the locations and criteria used to determine detections and amount of equipment involved in an engagement.

4.4.1.5 Terrain Data Base Resolution -

Due to the use of larger units and the greater size of the battlefield than currently used in ARTBASS, the resolution of the terrain data base will need to be changed from 25 meters per data point to 100 meters per data point. This will reduce computer processing requirements without any sacrifice in the fidelity of the battle simulation.

4.4.1.6 Time-Step Control -

A complete update of the battlefield events and status currently occurs once per minute in ARTBASS. For division level training simulation, which deals in data and events in a more aggregated manner, this frequency of update is not required. An update of battlefield events on a two-minute basis should be adequate for division training, and will significantly reduce the computer processing requirements.

4.4.1.7 Environment Representation -

Many algorithms in ARTBASS that deal with the environmental conditions of the battlefield are far too detailed for division level training. These algorithms involve weather, ambient light, background contrast, temperature, background wind noise, etc. These algorithms need to be reviewed and simplified to remove mismatches in the resolution of the model.

4.4.1.8 Training Feedback -

The training feedback mechanism in ARTBASS needs to be improved to provide rapid and meaningful training value to the training audience, and to provide a review and

analysis mechanism for the training professionals. This capability should include a color graphic battlefield situation display that shows unit dispositions and activities, status reports, key battlefield events, and performance measures in tabular and graph form. The training feedback material should be compiled using the training hardware/software system, and presented under control of a training professional to the training audience. A video and audio record of activities of the training audience could be integrated with feedback of the battle situation to reveal errors or delays in handling and processing battlefield information, and differences in the perceived versus the actual (simulated) battlefield situation. By using the computer system to construct and present the postexercise feedback, the actual feedback session can be saved and used as a means of training the trainers on methods and techniques of developing and conducting training feedback sessions.

4.4.1.9 Alert Aggregation -

The ARTBASS model causes alerts to be presented to controllers as a means of informing them of battlefield events for role playing purposes. Many of these alerts need to be modified to reflect aggregation of events or exceeding of thresholds, as would be more appropriate for role playing higher level units.

4.4.2 Baseline Enhancements

Enhancements will need to be made to ARTBASS to allow more realistic role playing of functions that are of particular importance in the division environment. The modifications noted above will provide a basic capability. The enhancements can then be added in building block fashion to provide incremental improvements in the training system capability. These enhancements concern the following functions:

- Administration/Medical
- Corps Resupply
- Maintenance
- Electronic Warfare
- Intelligence
- Transportation
- Fire Support Decision Logic
- Engineering Decision Logic

- Air Defense Artillery
- Air Strike and Air Lift

4.4.2.1 Administration/Medical -

The technique for administration and medical play can be derived from the techniques used in CAMMS-II and MTM. This will provide representation of evacuation and treatment of personnel by unit and critical MOS, and the replacement of personnel from a finite resource.

4.4.2.2 Corps Resupply -

ARTBASS currently models the resupply function, but enhancements will be made to accommodate interfaces to the corps and other high echelon supply resources.

4.4.2.3 Maintenance -

A capability for role playing maintenance functions will be installed based on the maintenance module previously developed for battalion play in ARTBASS. That module will be extended to consider division maintenance resources.

4.4.2.4 Electronic Warfare -

A function will be added to assist role playing of CEWI battalion activities. The techniques used can be derived from the TACSIM and STAR models.

4.4.2.5 Intelligence -

TACSIM is designed to model intelligence tasking and reporting functions, and to interface with a combat model driver. Joining TACSIM to ARTBASS can provide the basis of intelligence role playing for the division training simulation.

4.4.2.6 Transportation -

Transportation resource management and planning is an integral part of many activities in the division environment, including resupply, maintenance, administration (personnel replacement), and medical (evacuation). Simulation of transportation activities can be enhanced by use of road-following algorithms developed independently by SAI.

4.4.2.7 Fire Support Decision Logic -

An enhancement will be made that allows direct support artillery units to automatically (following specified decision rules) conduct fire missions for supported battalions. This will relieve the controllers from a heavy workload that is not directly impacted by division activities. The capability will still exist to conduct fire missions on command as is currently done in ARTBASS.

4.4.2.8 Engineering Decision Logic -

In a manner similar to fire support, decision rules will be followed to automatically perform certain engineering tasks for units that contain engineering assets. Such tasks might include minefield and obstacle breaching, and gap crossing. The capability will exist for a controller to manually request special engineering tasks in preparation of a mission, and to override automatically initiated tasks.

4.4.2.9 Air Defense Artillery -

The modeling of air defense artillery needs to be improved to provide a realistic airland battle environment. Functions such as target acquisition, target identification, weapons control, and air route control need to be simulated as well as attrition of air assets.

4.4.2.10 Air Strike and Air Lift -

The realistic use of air assets needs to be modeled to complete the division level airland battle environment. This will allow realistic battle outcomes to

be experienced by the training audience as a result of their planning for interdiction, close air support, and reinforcement.

4.4.3 System Configuration

The system developed for division training must be configured to support the training requirements discussed in Chapter 2. Briefly, there is a requirement to support a full-scale exercise at least twice a year, with on-going training of individual staff sections or groups of staff sections throughout the year. Considering the need to spend time in scenario development , data base preparation, post-exercise analysis and training feedback, and controller training, the system must be available to the organizations to be trained essentially on a continuous basis.

To give some perspective on the requirement for availability of the training system, it is expected that the twice-yearly full scale exercises will require the following amounts of time to go through a complete cycle:

Scenario Development	2 weeks
Data Base Preparation	2 weeks
Controller Training	2 days
Training Exercise	1 week
Training Feedback	1 day
Exercise Analysis	2 weeks
Total	2 months per exercise (approx.)

Subsequent upgrade of the system to allow training of individual staff sections throughout the year will result in almost constant use of the system, depending on the relatively reduced need for pre- and postexercise work. If each staff section exercise requires one month to complete the cycle, then eight of these smaller exercises could be conducted each year. Also, some overlap of activities could increase utilization of the system, as could potential use of the hardware components to service other training needs such as battalion and brigade simulation training, review and analysis of National Training Center live-fire and engagement simulation exercises, and computer-assisted instruction on staff procedures and doctrine.

The initial analysis of controller requirements in Chapter 2 indicates that as many as 18 controller stations will be required to support division training. Further

analysis of information flow and rates is needed to determine the load of role playing activities for individual functions. This analysis will suggest ways to allocate role playing tasks to both reduce the number of controllers needed, and to reduce the number of controller stations required. In any case, the need for controller stations will be in proportion to the detail and number of battlefield functions being supported by the training simulation. Thus, the system should be designed with growth potential taken into account, up to a maximum of 18 stations. Of these 18 stations, 16 will be used to support up to 48 controllers (an average of three per station) to role play friendly units external to the training audience. One station will be used to provide free play of the opposing force in response to decisions and actions of the command group being trained. The remaining station will be used by training specialists who monitor the training exercise in real-time, review the exercise either in real-time or after the training is completed, and construct and present a training feedback session using the computer facilities.

Figure 22 shows a conceptual view of the division training simulation system as it would be used during an exercise and after an exercise for training feedback. The box labeled "Simulation Process" represents all model and interactive software needed to drive the division training simulation. Chronological history data and statistics pertaining to a training session are logged to a disk file for use in postexercise training feedback sessions. The Simulation Process will support role playing by controllers at the brigade echelon, as well as at comparable supporting and adjacent units. A hardware configuration that would satisfy the short-term requirements for the division training simulation is shown in Figure 23 and 24. The configuration is based on a cluster of computers and data storage devices that communicate over a high speed computer interconnect capability with data rates of 3 million bytes per second. All disk and tape units are available to all computers on a continuous basis. Failure of a computer can be alleviated by moving functions between the remaining computers. For example, failure of the VAX running the simulation model can result in a degraded mode of operation where one of the remaining VAX's is assigned to running the model, thus leaving the system with nine controller stations. Similarly, loss of one of the Interactive Display and control VAX's, would reduce system capability to nine controller stations. The key attribute of the configuration is that there is built-in redundancy without requiring hardware reconfiguration. There is also a mechanism for easy growth of the system. Computers, disks, tapes, the intelligent disk/tape server, and even a STAR coupler can be added to the cluster to achieve greater capability or to

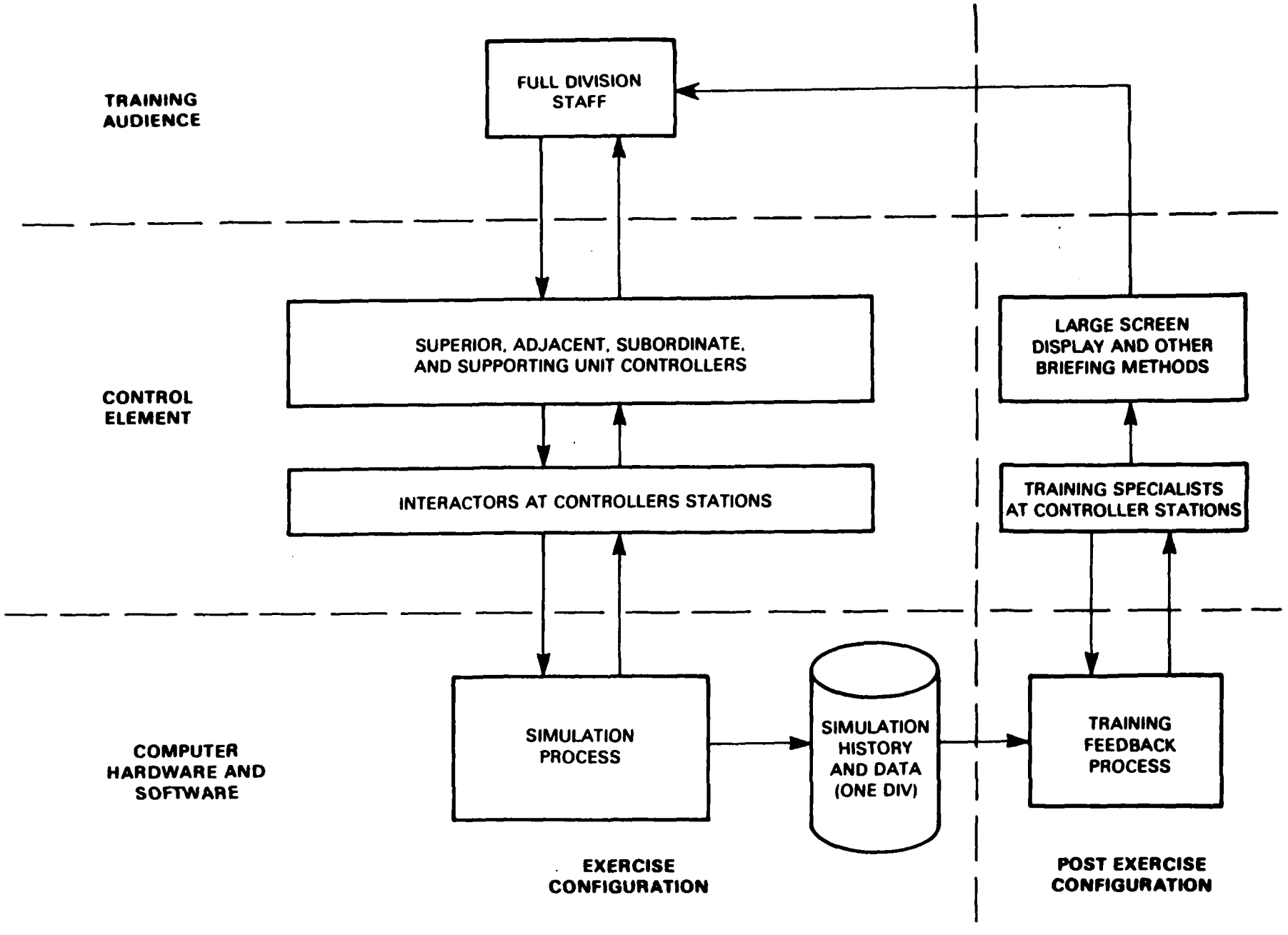


Figure 22. Division training concept.

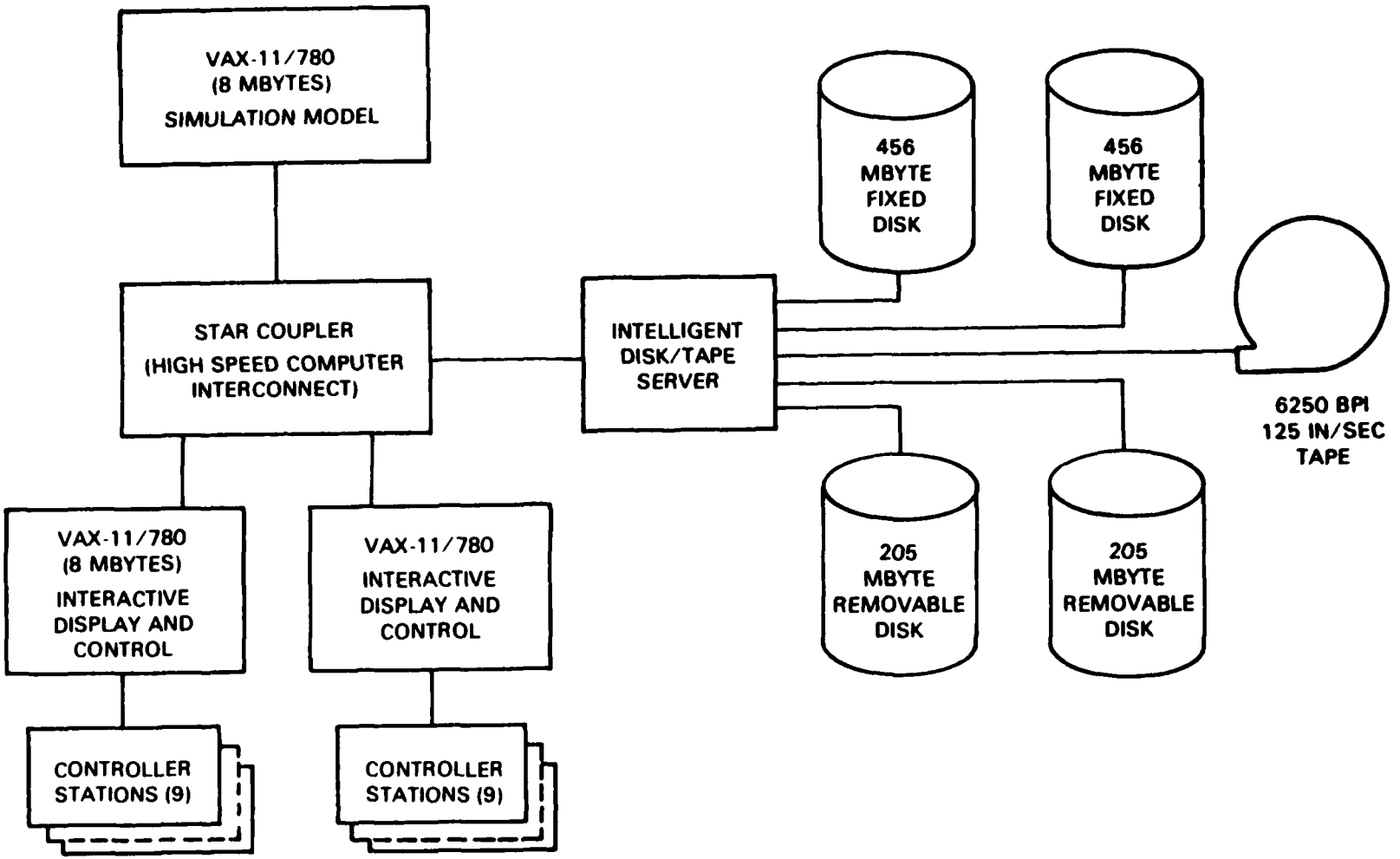


Figure 23. Hardware configuration.

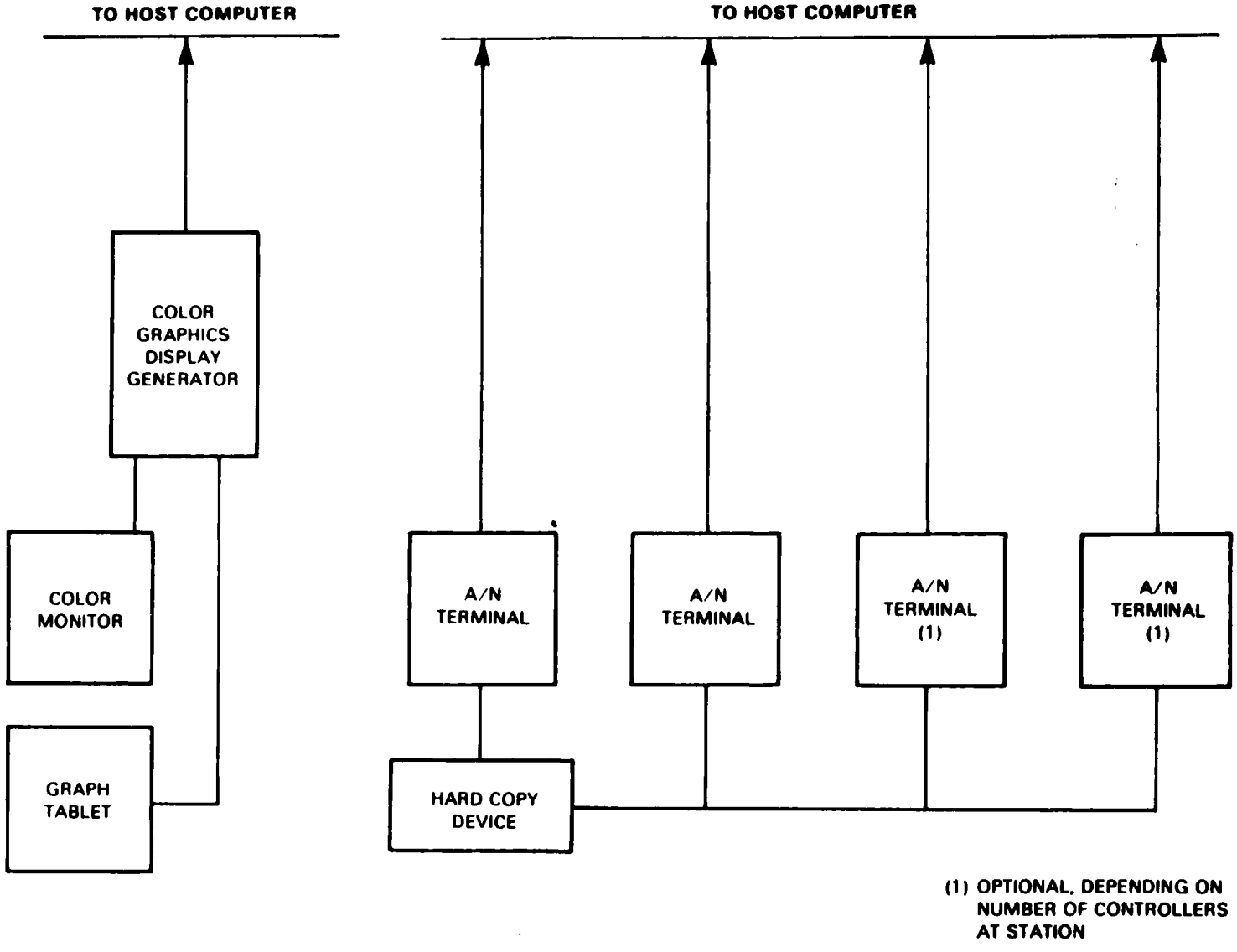


Figure 24. Controller station.

provide additional redundancy. Also, this cluster concept allows system development to proceed on an incremental basis by allowing software to be developed on a single VAX with local disk storage, proceed to a two-VAX configuration with local disk storage to provide initial operational capability, and then proceed to make disk storage available to all VAX's and add the third VAX.

The controller stations (Figure 24) will each contain a color monitor and graph tablet that are connected to a display generator. Cursor tracking using the graph tablet will be handled by the display generator, thus relieving the VAX host computer of continuous interruptions to draw the cursor position. Two to four alphanumeric terminals will be placed at each controller station, depending on the role playing requirements of the individual station. The A/N terminals will be logically (in software) connected to the station, but the electrical connections will be independent. This allows easy reconfiguration of the A/N terminals between stations as required by a particular training scenario. A single hard copy device will be shared by all A/N terminals at a station to allow a permanent record of key battlefield events and status reports to be obtained to assist later role playing.

The requirement for 18 controller stations is a maximum number; further analysis of the frequency of role playing actions may indicate that as few as 12 controller stations can handle a division training simulation exercise. The cluster configuration will accommodate this possibility. Experience with other systems (particularly the National Training Center Core Instrumentation System) indicates that a single VAX 11/780 can handle 12 controller stations with the type and frequency of interaction expected to occur with division training simulation operations. Additional stations can be added, but occasional delays in responsiveness can be expected to occur. A VAX 11/750 can be expected to comfortably handle six controller stations. Thus, depending on the number of stations required, a number of Interactive Display and Control configurations are possible and easily accommodated within the cluster. For example, there could be a single VAX 11/780 driving 12 controller stations, a VAX 11/780 driving 10 stations and a VAX 11/750 driving 5, a VAX 11/780 driving 12 stations and a VAX 11/750 driving 6, or the configuration pictured in Figure 23. From a redundancy standpoint, a configuration that uses a VAX 11/750 is less favored since that computer is not sufficiently powerful to run the simulation model.

Hardware costs to support the division level training simulation range from $975,000 for a cluster with two VAX 11/780's and 12 controller stations, to $1,425,000

for three VAX 11/780's and 18 controller stations (Figure 23). The hardware and system software needed to support the configuration described above is currently available off-the-shelf.

Although not required for the short-term, the configuration shown in Figure 23 can be easily expanded to train corps command groups. The analysis in Chapter 2 indicates that the controller station requirements for training the corps command group are approximately the same as for division, thus the Interactive Display and Control equipment requirements should remain the same. The simulation model will require enhancement to accommodate additional units, raise the level of data aggregation, and install additional functions such as joint operations. An additional VAX 11/780 can be added to the cluster to provide the additional simulation capabilities.

4.4.4 Incremental Implementation

The building block approach to implementing the division training simulation capability will reduce the risk of the total effort by providing early visibility into development progress and problems. By starting with a baseline that is already operational and contains many of the features needed to support command group training, development of the system can be considered to be a series of upgrades, each producing an operating system with increased capability. It is recommended that the upgrades be implemented by starting with the modifications described in paragraph 4.4.1 above, then incorporating the enhancements described in paragraph 4.4.2.

The baseline modifications are recommended to be implemented in the following groups, or packages:

- Package 1
  - Division level data base
  - Terrain data base resolution
  - Time-step control
  - Simplified environment

- Package 2
  - Operational state processing
  - Task organization

- Package 3
  - Detections and engagements
  - Alert aggregation

- Package 4
  - Training feedback

The baseline enhancements are recommended to be implemented in the following packages:

- Package 1
  - Fire support decision logic
  - Engineering decision logic

- Package 2
  - Intelligence

- Package 3
  - Air defense artillery
  - Air strike and air lift

- Package 4
  - Transportation
  - Administration/Medical

- Package 5
  - Corps resupply
  - Maintenance

- Package 6
  - Electronic warfare

There will be overlapping and concurrency of effort to implement these packages, but a configuration management scheme should be implemented that allows demonstration of these incremental upgrades throughout the development time period.

SECTION 5

LONG-TERM DEVELOPMENT APPROACH

5.1 SCOPE

This chapter explores projections into the future of computer technology, simulation and interactive techniques, and future needs of the Army for division/corps training. The intent is to arrive at a goal or direction that should be adopted to ensure that a completely adequate training simulation is available in five to six years that is state-of-the art at that time. It is not intended, however, to be completely "blue-sky" in this study; rather, reasonably conservative expectations are used to prevent getting locked-in to a slowly-maturing technology (e.g., flat-screen TV was once forecast to be commercially available by 1970).

5.2 TECHNOLOGY ASSESSMENT

The technology future of computers, memory capacities, communications, and man-machine interface devices are discussed below. The assessment is based on SAI's view of future developments, rather than vendor predictions (which tend to be self-serving and optimistic).

5.2.1 Computers

The commercial availability of next "generation" computers is probably eight to ten years away. Thus, the computers available in five to six years will be enhanced versions of currently available computers. This will amount to a 4:1 improvement in speed and improved clustering or

networking capabilities, for a cost comparable to current computers. The physical size of computers will also decrease somewhat.

5.2.2 Computer Memory

The capacities of primary memory will be two to four times greater than currently available. Small board-level minicomputers (16 bit words) will be able to access up to 4 Mbytes, while large superminicomputers (32 bit words) will be able to access 32 Mbytes. Secondary memory changes will be more extreme, due to anticipated improvements in Winchester disk technology. A cabinet that currently holds 500 Mbytes of disk storage will be able to contain 4 Gbytes, an 8:1 increase in capacity without any increase in cost. Also, storage capacity of static data bases (terrain, maps, etc.) will be improved through use of inexpensive optical (laser) disk technology.

5.2.3 Communications

It is not anticipated that a major increase in data transmission speeds will occur in the next five to six years. There will be improvements in reliability, availability, and reductions in cost for a given capability. Dial-up data transmission rates that are reasonably priced will probably remain at 4800 baud, while point-to-point connection between fixed installations will be capable of 50 Kbaud. The economics and design of satellite communications will favor applications where large amounts of data are transmitted in a short, scheduled period of time, rather than maintaining a continuous channel with relatively low amounts of data to be transferred.

5.2.4 Man-Machine Interfaces

Color graphics display generators using raster-scan technology will be the best choice as a simulation output display device. A screen size of 1280 X 1024 pixels will be commonly available and less expensive than current prices due to specially designed memory components within the display generator. The number and power of graphics commands will be increased to provide off-loading of tedious processing tasks from the host

computer. The display generators will also handle the other peripheral devices needed at a controller station, such as graph tablets and pens, printers, and A/N terminals. Inexpensive secondary storage, such as 10 Mbyte Winchester disks, will be available for direct access by a display generator, thus further off-loading data retrieval and processing tasks from the host computer. The display generators will be viewed as a node in a distributed processing system, rather than as a peripheral device.

5.2.5 Technology Summary

In the five to six year time frame, new generations of hardware are not expected to be available. Improvements and enhancements will be made to current hardware to provide additional power and increased flexibility in designing integrated systems of equipment. From a system standpoint, the most important improvements will be those that allow creation of system processors that contribute independently to satisfy the total system requirements. These improvements include the hardware/software to cluster computer resources, and powerful and cheap processors that allow distributed processing to be practical.

5.3 SIMULATION ASSESSMENT

The simulation required to support division/corps training is discussed in this paragraph in the following terms:

- Basic simulation concept
- Type of simulation
- Resolution
- Compatibility
- Controller/role player orientation
- Training feedback and evaluation

5.3.1 Basic Simulation Concept

From a structural standpoint, the training simulation will be composed of four models:

- Combat model
- Measurement model
- Interpretation/aggregation model
- Control model

The combat model portrays the evolution of the state of the battle "system" (the opposing forces and the environment in which they exist). The combat model responds to commands from either controllers or the control model, uses data bases that represent the environment and force capabilities, and maintains a current detailed representation of the "ground truth" of the battle.

The measurement model uses a data base that represents the capability of the forces to observe each other (visual, aural, electronic, imagery and other sensors) and the ground truth representation of the battle. The output of the measurement model is combat events and status that would be reportable by the various sensor capabilities.

The interpretation/aggregation model processes the output of the measurement model to change the "ground truth" combat events and status into the form and language that would normally be used at appropriate unit elements. The data interpretation and aggregation that takes place is based on a data base that specifies rules and logic for handling data at defined unit elements. The output of this model is data in a form that controllers can directly use to role play simulated elements to elements of the training audience.

The control model processes the output of the measurement model to determine the most likely course of action that would be pursued by a simulated unit. A data base that specifies the rules and logic for making these decisions is used as a basis for evaluating the measurement data. The outputs of the control model are commands to the combat model that represent actions taken by the command elements being simulated.

A key element of this simulation concept is the modular separation of the combat model, which can be considered as an environment generator, from the models that react to that environment. A second key element is the emphasis on controller role playing requirements and aids that are provided by the interpretation/aggregation and control models. A third key element is the extent to which the training simulation is data-driven. This allows many

new weapons, sensors, or doctrinal concepts to be incorporated into the training simulation without extensive rewrite of the software. The modularity of the concept allows algorithms affecting the fighting environment (combat model), sensor capabilities (measurement model), or doctrine (control model) to be modified or updated without impact on the other parts of the simulation.

5.3.2 Type of Simulation

There are two basic types of modeling that support simulations; deterministic and stochastic. The basic distinction between the two approaches is that certain events (such as detections, firings, kills) occur in a deterministic model when a specified set of conditions or a specified threshold has been reached, wherein a stochastic model these same events will occur in a random pattern around a mean threshold value or within a defined range of values. There are pros and cons for each approach which involve issues of realism and computing efficiency.

The computing efficiency issue is rather straightforward, in that stochastic models require additional tasks of determining a random number and comparing to a normalized function in order to determine the outcome of a set of conditions, where deterministic models can calculate the outcome directly. Thus, stochastic models tend to be less efficient than deterministic models.

The realism issue is more obscure to address. In its simplest view, it is safe to say that no event occurs at exactly the same time given the same set of conditions, particularly when human judgment and processing is involved. Two persons will not recognize the presence of an enemy tank at exactly the same time, nor will they necessarily recognize a given object as being a tank. Using this criteria, it is safe to assume that there is a random quality to the elemental aspects of battle, and that these aspects are most realistically and accurately simulated using a stochastic model. However, for the training of division and/or corps command groups the accuracy and realism of the detail treatment of combat events is of much less importance than the "apparent" realism of the largely aggregated results which are presented to these staffs. Deterministic treatment of these events by the simulation can provide outputs which appear realistic and are credible to the training audience. The training exercise will, because of the human interaction required, be stochastic. The perception of events by the staff and commander, the decisions which they make based on that perception, the

orders issued, the interpretation of those orders by controllers, the controller input to the simulation, and the time required for this process will not be deterministic except by exact repetition.

Another consideration in the deterministic/ stochastic dialogue relevant to a training simulation is the consistency and repeatability of a given scenario. When training evaluation is being attempted, stochastic processes within the simulation tend to mask the effect that battle decisions have on later battle outcomes, whereas a higher degree of traceability occurs with deterministic models.

Given the above considerations, the division/corps training simulation should employ deterministic modeling techniques at a high level of detail and avoid stochastic techniques unless required to lend a degree of realism to events that are modeled at a level of detail very important to the training audience.

5.3.3 Resolution

The arguments relating to the resolution of a model are similar to, and impact on, the deterministic/stochastic arguments discussed above. However, another issue is involved, the credibility of the model. Many users of battle simulations do not question the modeling techniques used as long as the battle outcomes "seem right". However, other users who investigate the simulation techniques involved, tend to lose confidence in a model whose attrition and ground-gained algorithms are based on gross force-ratios and exotic differential equations that appear to have little relation to the physical aspects of the battlefield. On the other hand, confidence in the model is higher when the model is based on physical aspects of the battlefield. Such physical aspects include detections based on terrain, vegetation, movement, light, weather, and obscuration; firings based on weapon types, target types, ranges, and mission type; kills based on known probabilities for given weapons, targets, and ranges.

It is possible to present "realistic" battle outcomes through careful choice of differential force-level equations at low resolutions, but such techniques are not readily defendable except on theoretical grounds. Given adequate processing power, simulation based on the physical aspects of battle at relatively high levels of resolution is preferable.

5.3.4 Compatibility

It is desirable that the division/corps training simulation have a common basis and compatibility with training simulations used at other echelons. This will give consistency of training across echelons, and an easier means of upgrading and maintaining configuration control across the spectrum of training simulations when weapon, sensor, or doctrinal changes are made. This does not mean that the division/corps training simulation must conform to existing training simulation methodologies; rather, the division/corps methods should be designed to be adaptable to other echelon training simulations.

5.3.5 Controller/Role Player Orientation

An important consideration for a training simulation is the man-machine interface and built-in aids to support controllers in their role playing duties. A major problem with division and corps CPX's is the employment and training of large numbers of controllers. The training simulation must be designed from the start to support controller role playing by orienting the model and man-machine interface toward relieving the controller of tedious interpretation, translation, and decision-making duties. This will not only allow a controller to more realistically role play a given element or staff position but also potentially allow the controller to assume greater role playing duties, thus reducing the number of controllers needed for a given exercise. The interpretation/aggregation models discussed in paragraph 5.3.1 above are intended principally to address this need. These models, and the related man-machine interface techniques, are the main points of distinction between a training simulation and other simulations such as war games and analytic models.

5.3.6 Training Feedback and Evaluation

A key requirement of the division/corps training simulation is the ability to capture the events, training audience actions, and on-going situation of the battle. This data can be used to reinforce the value of a training exercise. During the exercise the training audience is engaged heavily in fighting and winning the battle, and is

being trained in an experiential manner. They have little time during the exercise to reflect on possible procedural errors and mistakes in judgment. After completion of the exercise, while the events are still fresh in their minds, the training audience could benefit greatly by a structured review of the scenario, key events on the battlefield, the relation of the perceived situation versus the (simulated) ground truth, and the battle outcomes that resulted from their decisions and actions. The division /corps training system should contain the capability of recording all necessary data for later feedback, and the interactive mechanisms whereby training specialists can compile data and orchestrate a meaningful training feedback session . This recording and compilation capability can also be benefical to the training specialists who need to evaluate the status of training and develop innovative means and methods of accomplishing training using the division/corps training system.

5.4 SYSTEM ARCHITECTURE

The architecture of the long-term division/corps training simulation system is dictated by requirements and concepts discussed in Chapter 2, by the technology expectations for the long-term period, and by the doctrine used by corps and division command groups. Key issues that influence the system architecture are listed below.

- Varied training audience
- Availability and reliability of system
- Availability of controller staff
- Responsibilities of corps and division echelons
- Cheaper and improved hardware/ communications
- Distributed/dispersed command and control

- Use of automation by division/corps command groups

The system must be able to support training of complete division/corps command groups in their normal tactical configurations, and it must be able to support training of individual elements of those command groups.

Controller/role player support must be flexible to allow simulation of brigade and division support units for training division staff elements, and simulation of division and corps support units for training corps staff elements. The system must use the same level of detail and language to report battle events and status as is normally used among live operational units. This will allow controllers to be easily trained in their role playing duties. The controller staff is expected to be made up of key personnel from the same staff elements that are being simulated. For example, in a situation where the training audience is the full corps staff and the full staff of a single division, controllers will be role playing brigade-level units to the trainee division using a division-level simulation, while other division-level simulations will support controllers role playing division-level units to the trainee corps. In one division the staff personnel are being trained, while in the other divisions key staff personnel are acting as controllers.

An important aspect of the architecture is the unique responsibilities of the corps as compared to the divisions. In addition to the duties of directing, monitoring, and sustaining the combat operations of subordinate divisions, the corps has responsibility for the battlefield area deep into enemy territory, beyond the normal purview of the divisions. The corps must gather intelligence on this deep area and, when deemed appropriate, employ weapons that directly support the corps to strike targets deep in enemy territory. The planning window of a corps (72 hours) requires a more extensive view of the battlefield than does the planning window of a division (24 hours). The system architecture must support the simulation requirements that are unique to the corps, in addition to providing three division's worth of battlefield simulation.

New doctrinal concepts regarding the deployment and operation of corps and division command group elements must be supported by the system architecture; specifically, the employment of dispersed or distributed command elements must be accommodated. These dispersed command groups need to be trained as separate elements, or in total. Also, automation tools and techniques that are employed by the

command groups must be supported by the architecture. For example, digital message formatting and transmission devices that support message traffic between command group elements and simulated units must be simulated by the training simulation system. This will greatly enhance the training of use of automation equipment in battlefield situations.

The concept of training that drives the architecture of the division /corps training system is shown in Figures 25 through 27. The concept for training a full corps or division staff (Figure 25) is the same as presented in Chapter 4. During the exercise, data is collected into a simulation history, which is then used to provide feedback to the training audience.

For training of individual staff elements (Figure 26), the concept is identical except the mix of controllers is changed to provide role playing of the other staff elements and eliminate external units except those that interact directly with the trainee staff element.

For training division and corps command groups concurrently, the concept is as shown in Figure 27. In this concept, each division staff is trained as shown in Figure 25, except the corps staff is real instead of being role played. The corps staff interacts mainly with real division staffs, and interacts with role players only as necessary to provide echelon above corps and other high level play. The simulation of the tactical battle is performed by the simulation process for each individual division, and data reflecting the events and status of the division simulations are used to construct a corps-level picture and history of the tactical battle. An additional simulation module will be required at corps to:

- consolidate division level data;

- allocate resources to divisions in accordance with decisions of the corps commander;

- simulate the action of corps subordinate elements, other than divisions;

- support controllers representing those organizations; and

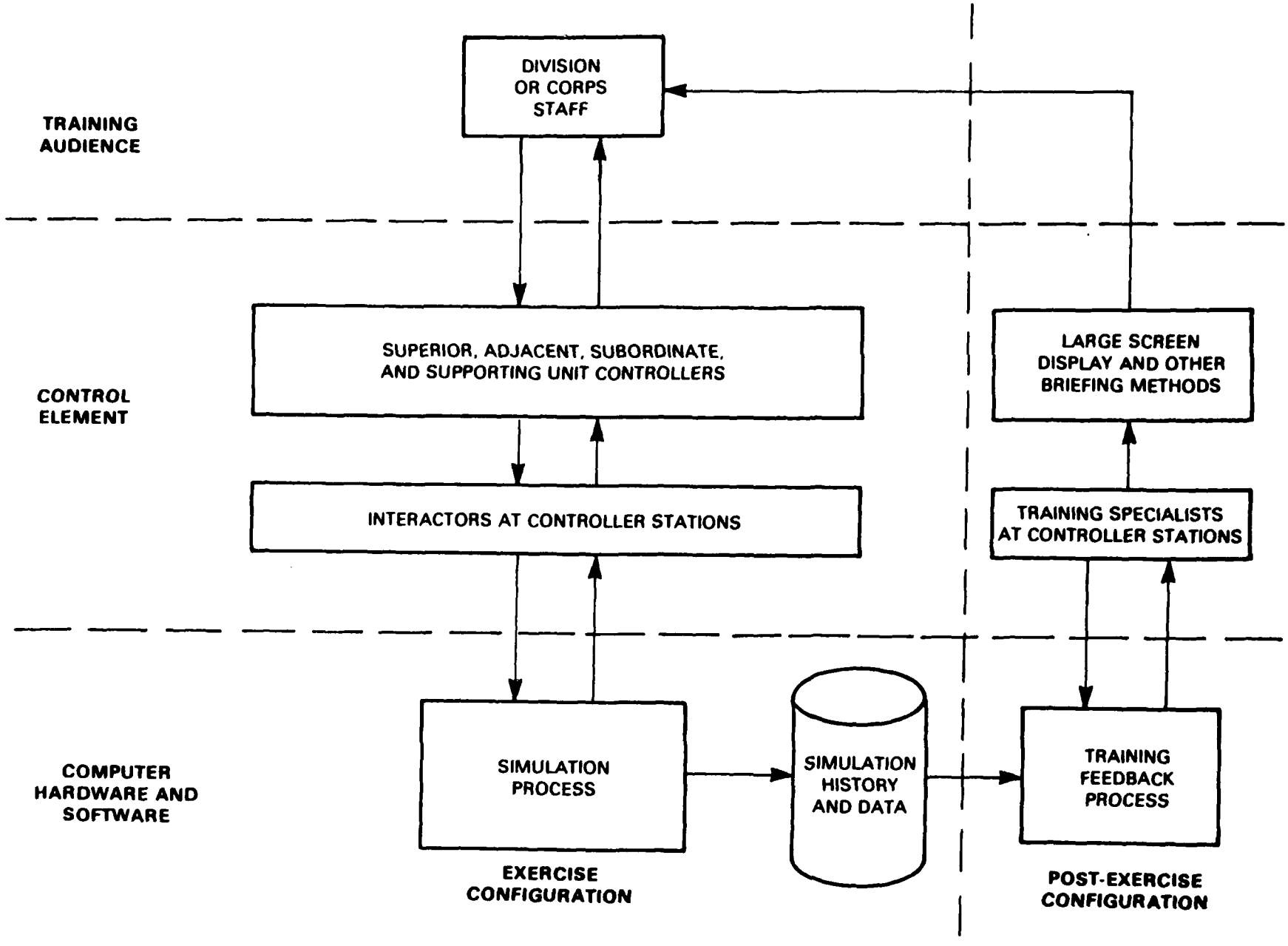


Figure 25. Full staff training concept.

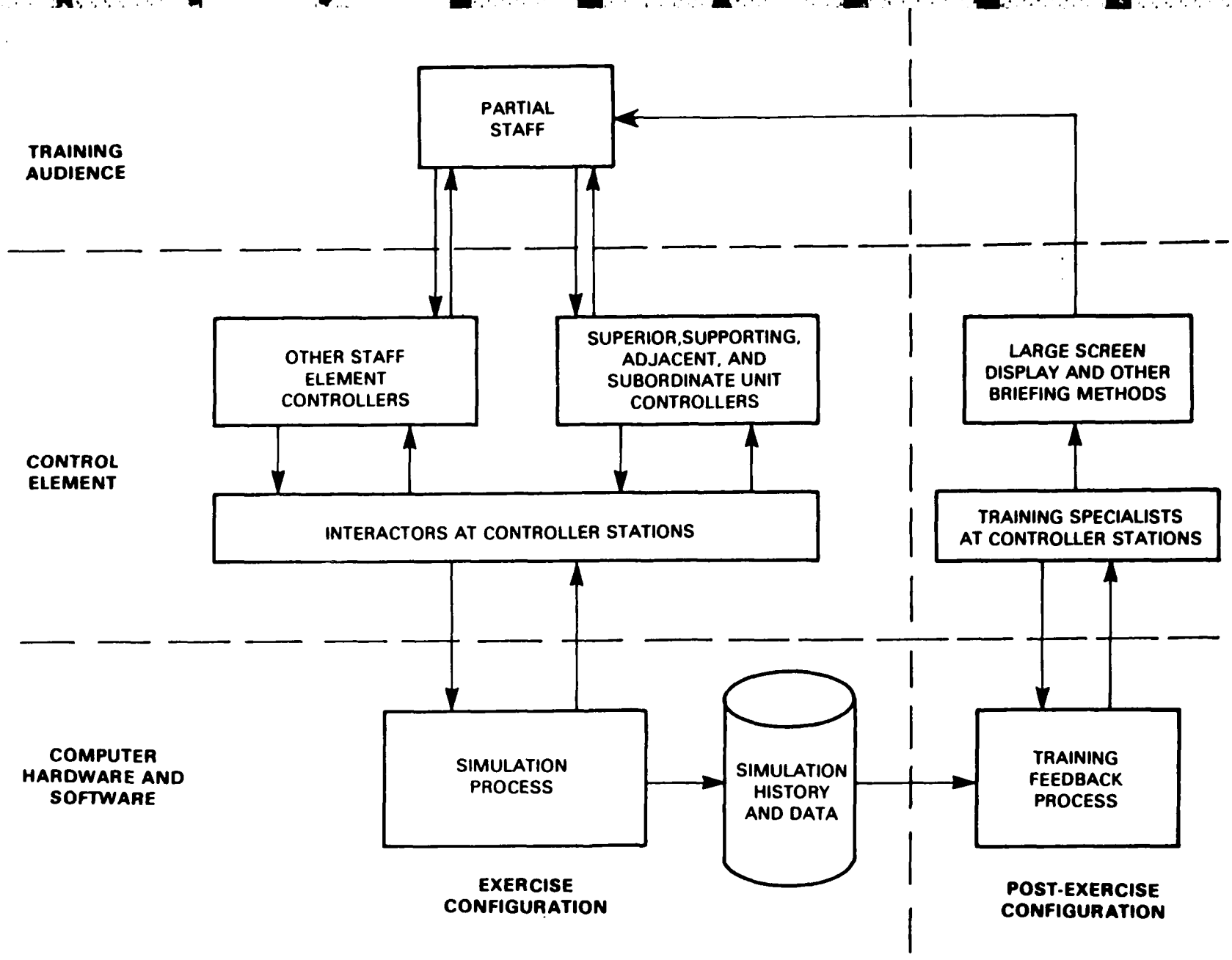


Figure 26. Partial staff training concept.

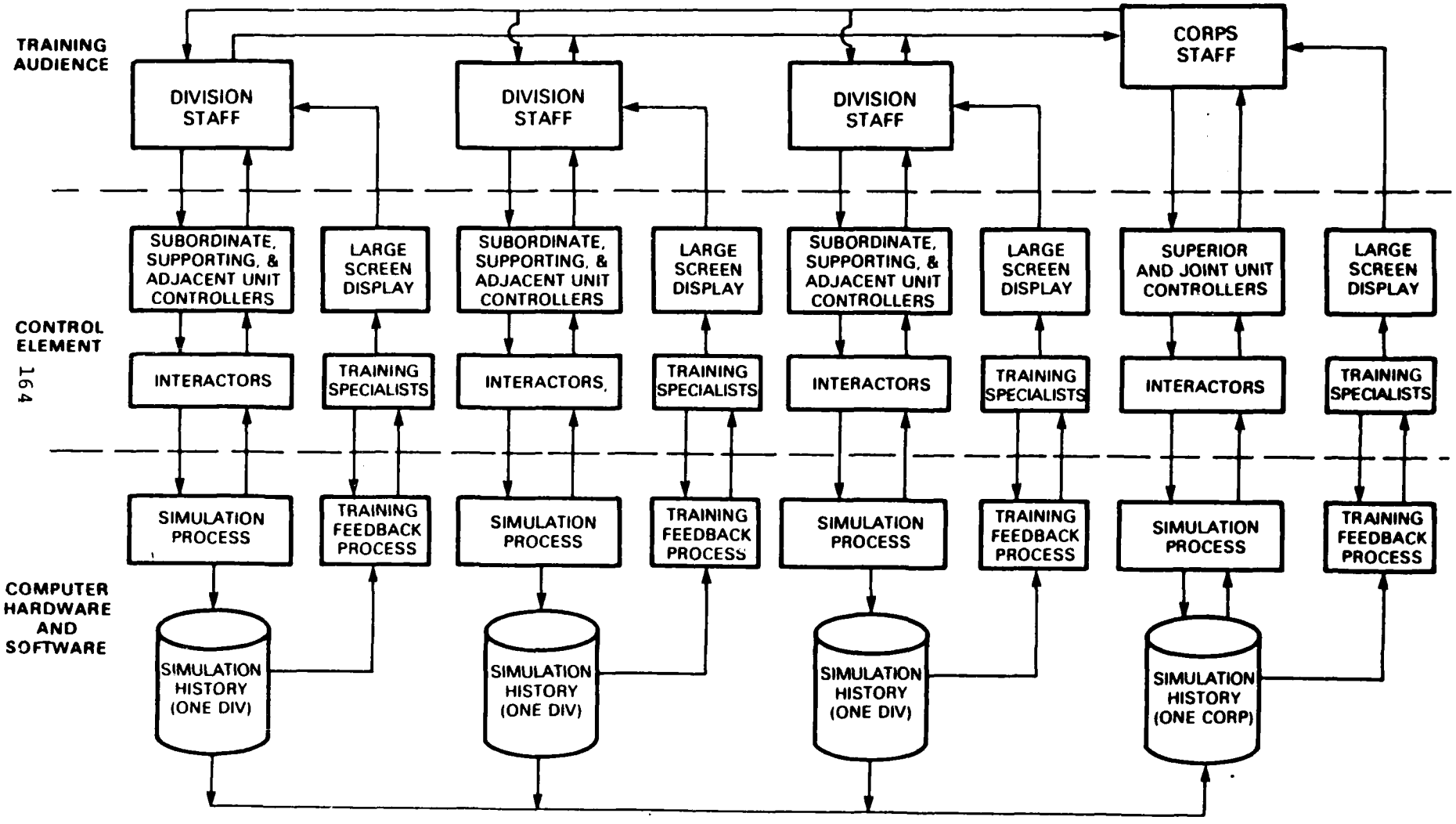


Figure 27. Full Corps and division training concept.

- simulate the extended battlefield depth and other special characteristics of the operational aspect of the airland battle.

Data from this operational simulation will be added to the corps-level tactical battle data to create a complete situation and history of the corps-level exercise. This corps simulation history will then be used to provide training feedback to the corps staff.

A training exercise involving both division and corps staff personnel as the training audience will require careful planning of the scenario and close coordination during the exercise. The coordination mechanism is provided through the automatic compilation of the division tactical battles and the corps operational battle into a single data base and history. The benefits of conducting such a multiechelon exercise are the real interactions that will occur between the divisions, and between the divisons and the corps.

Based on the technology assessment in paragraph 5.2, the hardware configuration of division/corps training system will be similar to that described for the short-term solution in Chapter 4. The increase in performance expected over six years will result in a combination of greater flexibility and reduced cost for equivalent performance of the system. The power and redundancy of a division/corps training system should be equivalent to the following currently available equipment:

- Division
  - 3 VAX 11/780 computers w/8 Mbytes
  - 1.5 Gbytes disk storage
  - 18 Display generators/monitors
  - 18 Graph tablets/touch panels
  - 48 A/N terminals
  - 18 Hard copy devices
  - 1 Large screen display

- Corps
  - 4 VAX 11/780 computers w/8 Mbytes
  - 3 Gbytes disk storge
  - 18 Display generators/monitors
  - 18 Graph tablets/touch panels
  - 48 A/N terminals
  - 18 Hardcopy devices
  - 1 Large screen display

In addition, each division and corps suite of equipment will need communication capability of at least 4800 bits per second. This will allow concurrent exercising of division and corps command groups according to the concept described in Figure 27. Experience with remote controller stations being driven by CATTS (an ARTBASS predecessor)indicates that 4800 bits per second communication capability should be ample to update a remote data base by transmitting simulations events and status changes. The remote facility can process the events and status data to update the data base. This technique avoids the high communications band width required to transmit complete files or data base structures.

5.5 DEVELOPMENT APPROACH

Within a six year period, the development approach that has highest probability of success is to build-on and expand the short-term system described in Chapter 4. This will provide the desired basic capability (possibly in less than six years), but will not provide the out-year flexibility and modularity of training simulation that is described in paragraph 5.3.1. A variation on this approach is to more aggressively exploit the technology changes expected to occur in the near future. One result of technology advancement that can be expected in the two to three year time period is the availability of "stand-alone" work stations; that is, desk-size units that are driven by powerful minicomputers, contain imbeded disk storage, and have both a monochrome alphanumeric terminal and a high resolution color monitor. The availability of such work stations is being driven by the CAD (computer assisted design) market, where such a capability provides a high productivity multiplier for a variety of engineering tasks. Typical performance measures for these work stations are; computer power equal to a VAX 11/780, disk storage of 1 Gbyte, and color graphics with resolution of 1280 X 1024 pixels and up to 24 bit planes of color memory. Price of such stations will probably be under $100,000. Although the designed use of these work stations emphasizes stand-alone activities, it is possible to install communications equipment in them to allow interfacing between stations or to a host computer.

The work station technology can be exploited as a means of satisfying the requirements of a divison/corps training simulation system. For example, each work station could be configured as a controller station with the local

computer performing both tasks of simulation modeling and interactive display and control. To allow this capability, however, both tasks will need to be reduced in scope. The station could simulate the battlefield activites of one brigade, and receive via communications with other stations the status of other units in the division. Of course, interactive display and control would only be performed for the single controller station. The architecture needed to exploit this technology involves allocating computer resources by unit or function role playing, rather than between software functions of simulation and interactive display and control.

Further study is needed to assess risks and determine design approaches that will exploit the work station capabilities. Issues to study include the amount and type of data that needs to be transmitted between stations, the need for and functions of a computer node that serves as a master system controller, and the methods and techniques required to perform training feedback.

Although the above issues need to be resolved before the work station architecture can be termed viable, there are some obvious advantages to the approach. The main advantage is that any individual station can be logically separated from the network to perform tasks in a stand-alone mode. Such tasks might include scenario preparation, data base preparation, controller training, and postexercise reviews and analysis. Another advantage is the greater redundancy in availability of controller stations.

A second, higher risk, approach is to "start from scratch" on the design and development of a modular, structured training simulation that is intended to be installed on the equipment described in paragraph 5.4. This will undoubtedly take more time and effort to implement than building on the short-term capability.

A prudent approach is to take the first approach, which uses known hardware and software technology, and is based on a clear incremental development approach from today's capability to the final division/corps training system. At the same time, a research project could be initiated to determine expectatons for hardware technology in the 10-15 year time period, and begin design of a division/corps training simulation that would both exploit the future technology, and also be able to support training over an extended period of time with new weapons, doctrine, and combat support techniques.

5.6 RECOMMENDATIONS

- For six year time frame:

  - Plan on building on the short-term hardware/software configuration

  - Study the network and communications issues for possible exploitation of "work station" technology

- For 10-15 year time frame:

  - Develop technology projections

  - Design a flexible, adaptable simulation software system

  - Design means to use simulation software on projected hardware

ATTACHMENT

INFORMATION FLOW ANALYSIS

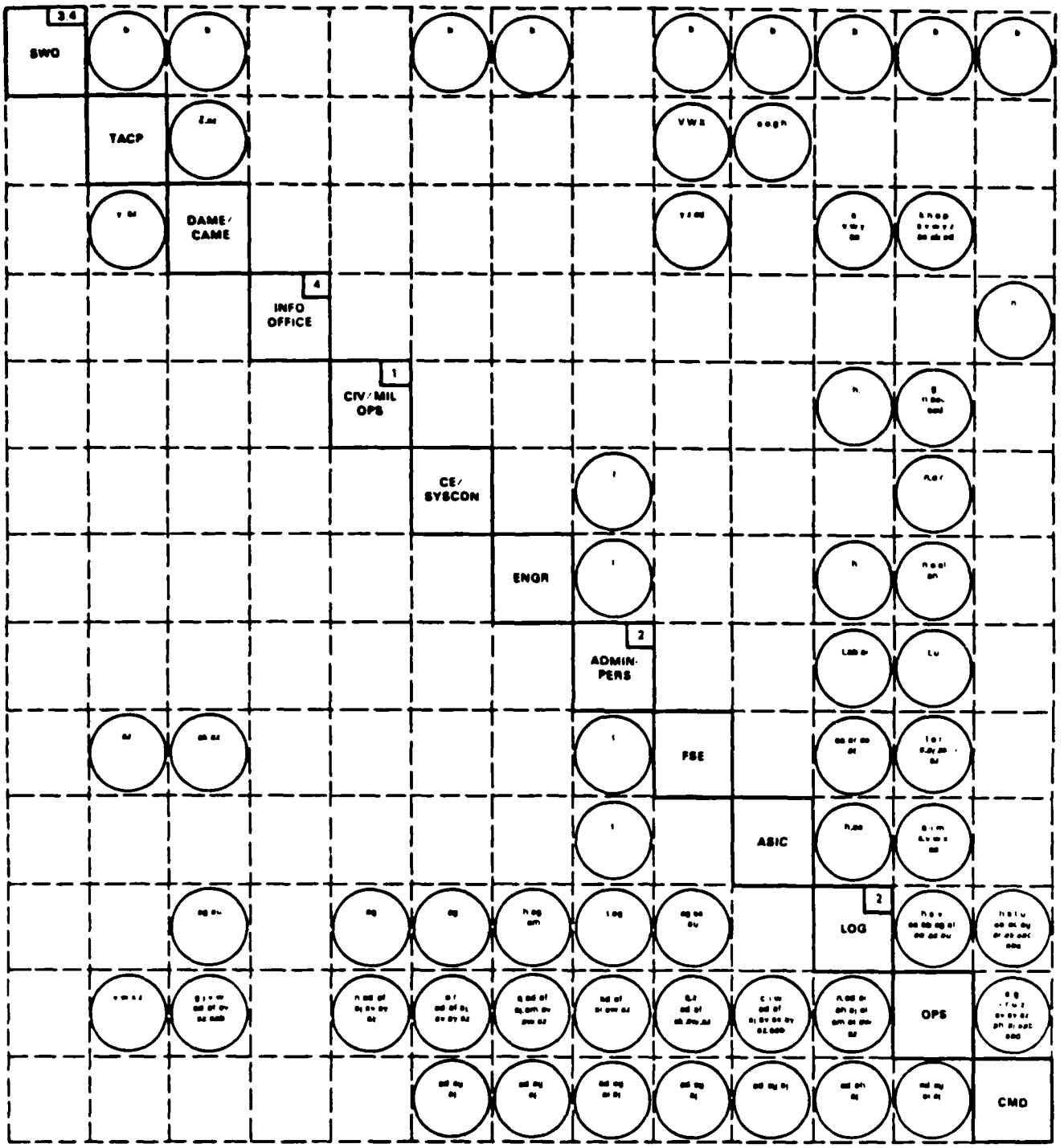
The N^2 (N square) chart provides a simple method for the analysis and highlighting of interface requirements in a system. It is constructed by placing the system components on the diagonal of an N X N matrix, where N is the number of components in the system. Information flow is defined from each system component along the row of that component; that is, to the right or left of the diagonal. Information flow into each component is defined in its column; that is, from above or below the diagonal. Therefore, all information flow is to the right of the diagonal and then down, or to the left of the diagonal and then up. Each row-column intersection off the diagonal, therefore, defines a possible interface. Actual required interfaces are indicated by a circle thus highlighting each and further highlighting and requiring justification for any which are not required.

Figures 28 through 39 provide the N^2 charts for the corps and division staffs based on analysis of the referenced documents and Table 4. The information flow at each required interface is defined by the pertinent information items from Table 4. No attempt has been made at this time to define specific data elements for the interfaces. The references in the N^2 charts presented here mean the appropriate data elements of that information item in the appropriate mode, request, or response. It will be necessary in the future to refine the interface requirements into the specific data elements and to define the timing and required level of detail of each.

The term MSC (Major Subordinate Command) has generally been used to denote all subordinate commands of either the corps or division as appropriate. (Typical division structure is shown in Figure 2. Typical subordinate elements of the corps are shown in Figure 8.) In those cases where the information interface requirements are significantly different for a particular subordinate, that element has been specifically shown.

Figure 28 defines the information interfaces internal to the MAIN CP. (Figures 6 and 11 provide details for each of the sections of the division and corps staffs, respectively.) The system components, diagonal elements, are the major staff elements defined as the training audience. The primary purpose of this analysis is to determine the information requirements of the simulation and/or controller personnel, that is, the information which must be presented to the trainees. (The term controller is used here to denote any personnel which directly and obviously interface with the computer simulation. All player or trainee interfaces should appear to the trainee as normal communication with the desired agency and not with a simulation.) Figures 29 through 39 define these external (to the training audience) information sources. Figures 2 through 37 present separately the external interfaces of each major staff section of the MAIN CP. Internal and external interfaces are combined on one chart for both the TAC CP, Figure 38, and REAR/Division Support Area CP, Figure 39. Information flow between elements of the various CP's is not shown since it will essentially consist of coordination of any and all pertinent information between the corresponding elements.

Table 16 provides a listing of the information item transfers for each of the "From-To" pairs identified in the N^2 analysis. Table 6 corresponds directly to Table 16 with all internal staff information interfaces eliminated.



NOTES
1. DIVISION G-5 NORMALLY OPERATES FROM DSA (REAR).
2. DIVISION G-1 AND G-4 NORMALLY OPERATE AS CSS ELEMENT.
3. NOT INCLUDED IN CORPS TRAINING AUDIENCE.
4. RECOMMEND DELETION FROM TRAINING AUDIENCE.

Figure 28. Main CP - internal information flow.

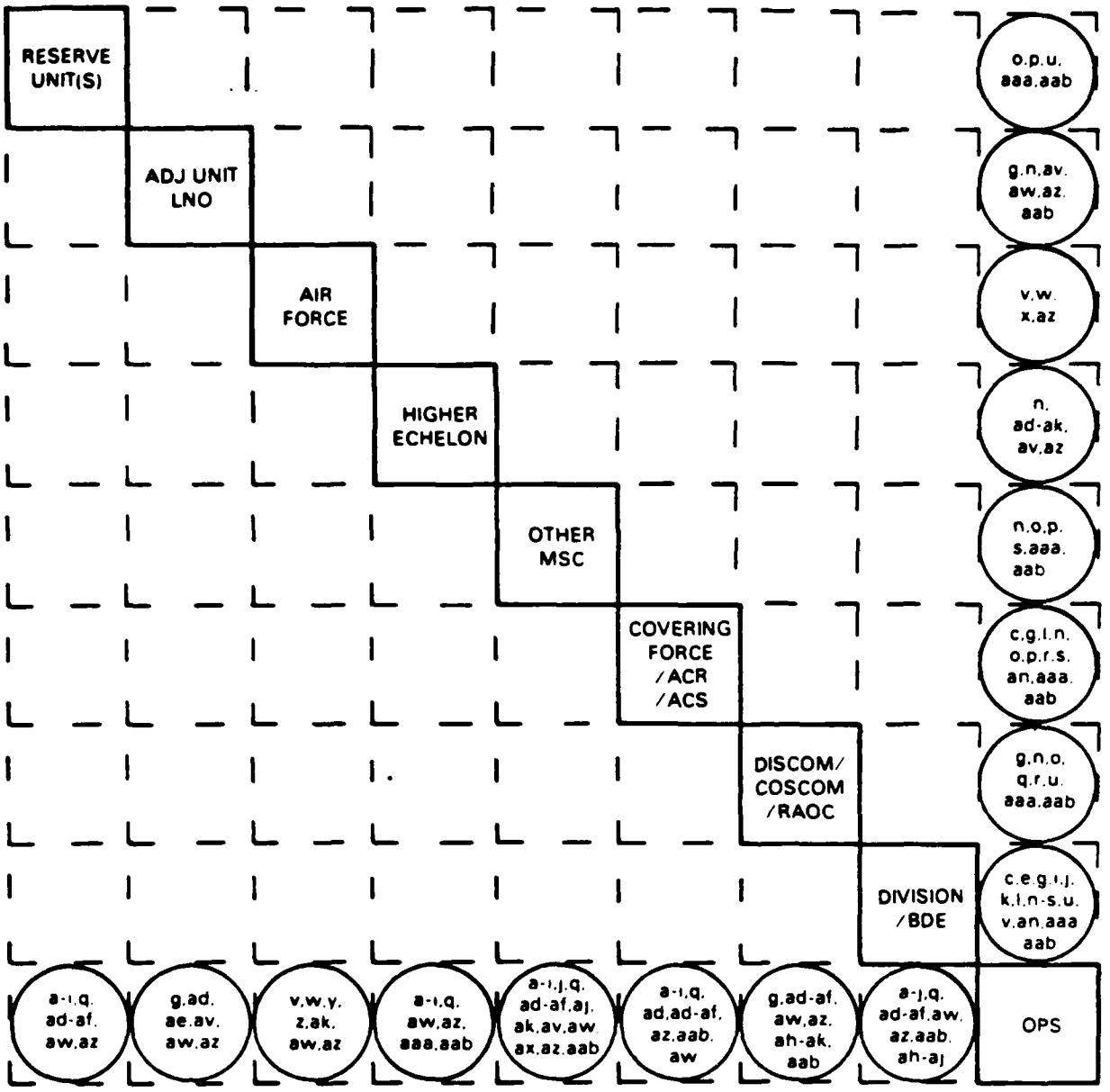


Figure 29. Operations section main CP - external information interface.

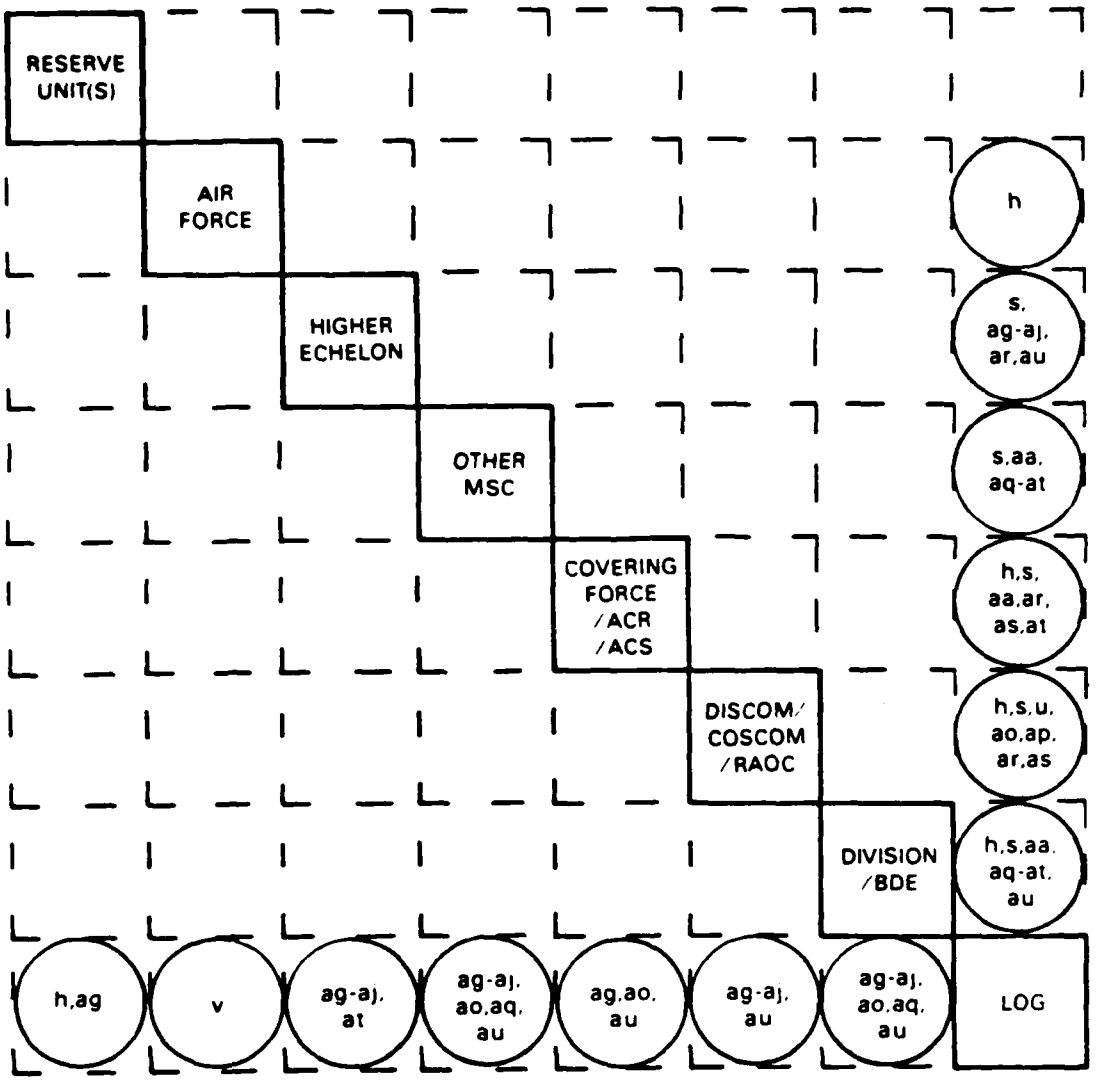


Figure 30. Logistics section, main CP - external information interface.

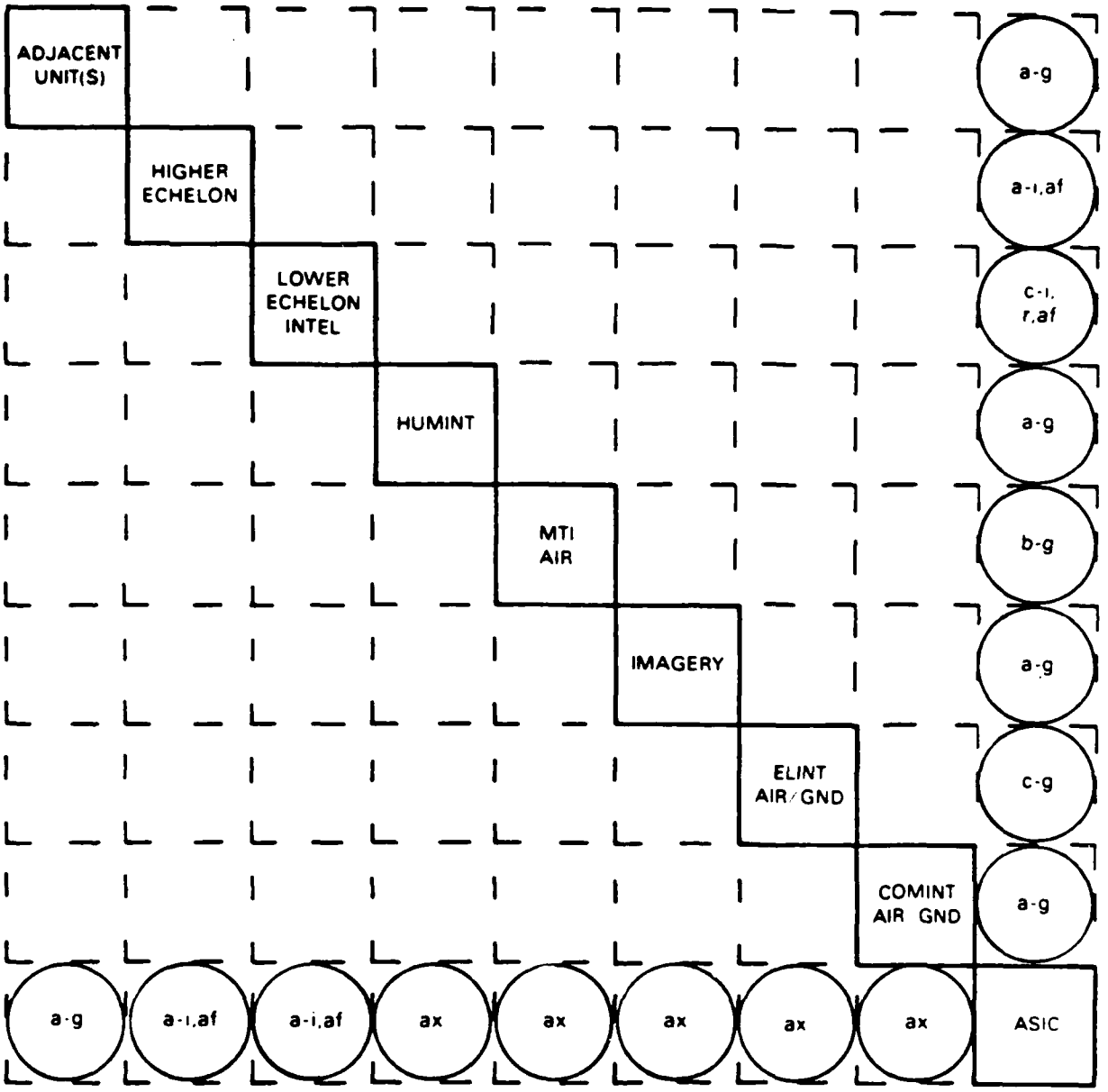


Figure 31. ASIC, main CP - external information interface.

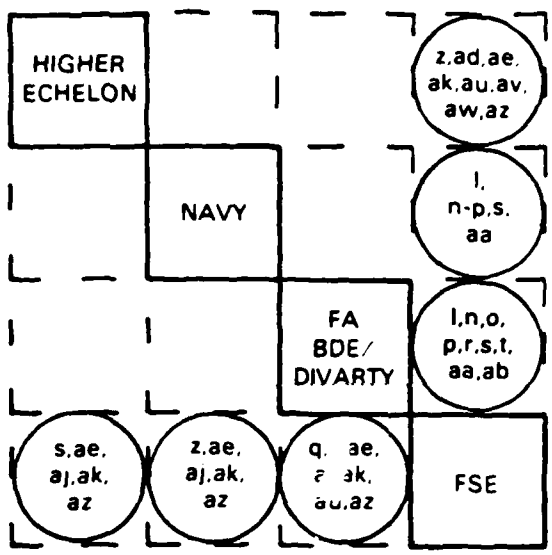


Figure 32. FSE, main CP - external information interface.

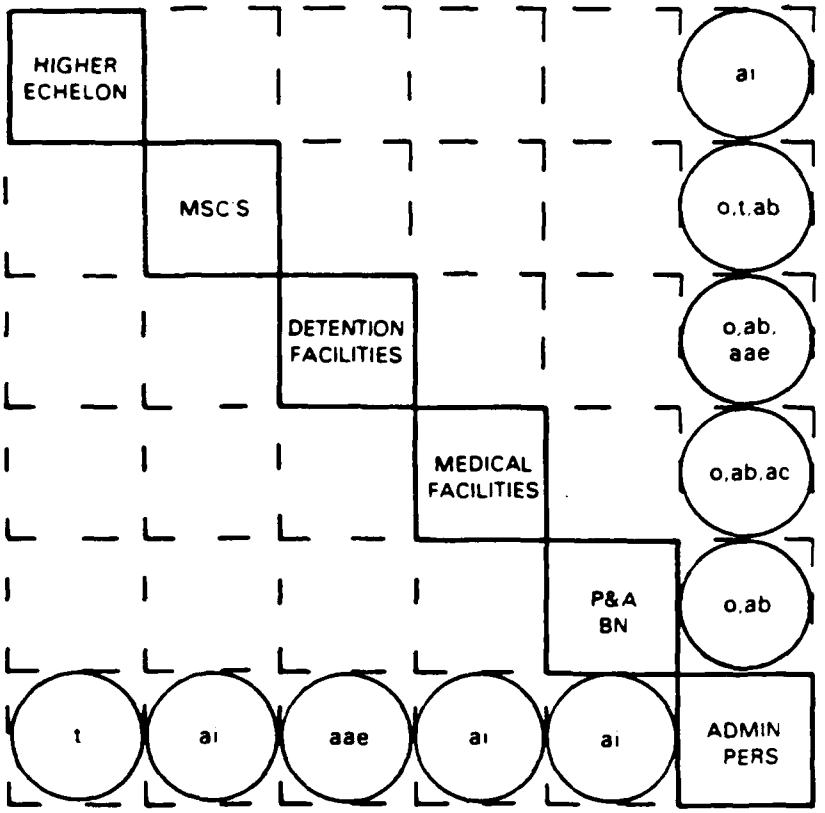


Figure 33. Admin/personnel section, Main CP - external information interface.

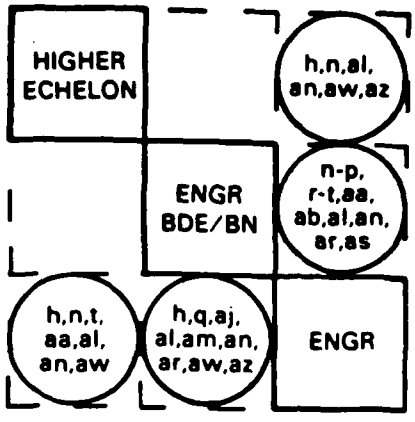


Figure 34. Engr sec, main CP - external information interface.

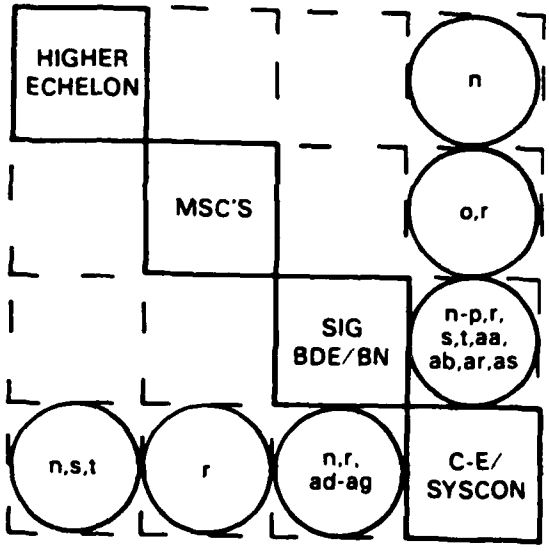
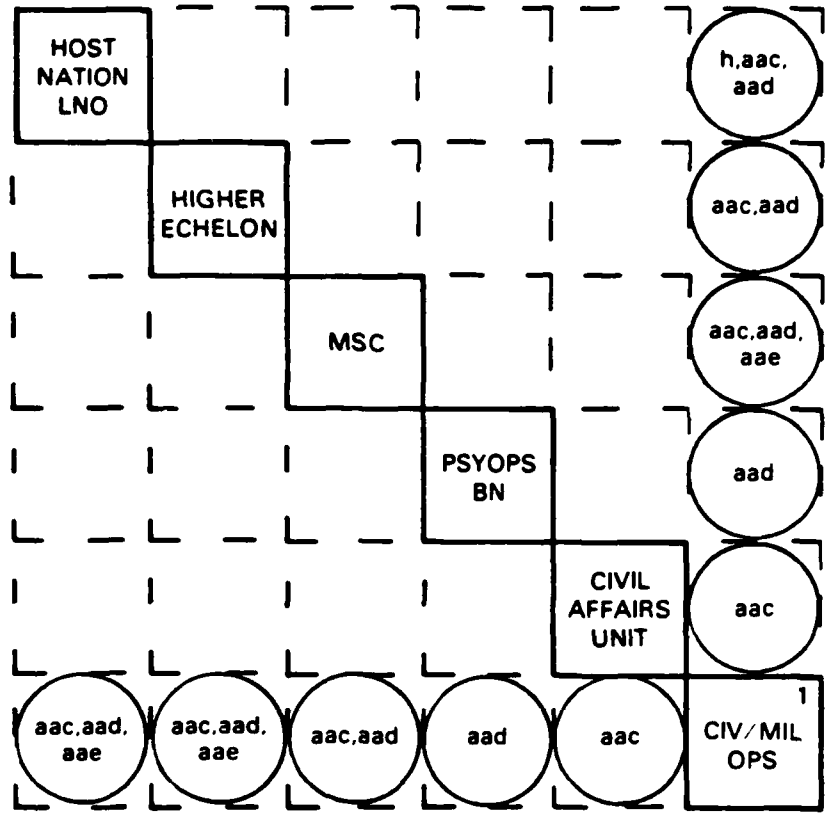


Figure 35. C-E section, main CP - external information interface.



1. DIVISION G-5 NORMALLY OPERATES FROM DSA (REAR).

Figure 36. Civil-military operations section, main CP - external information interface.

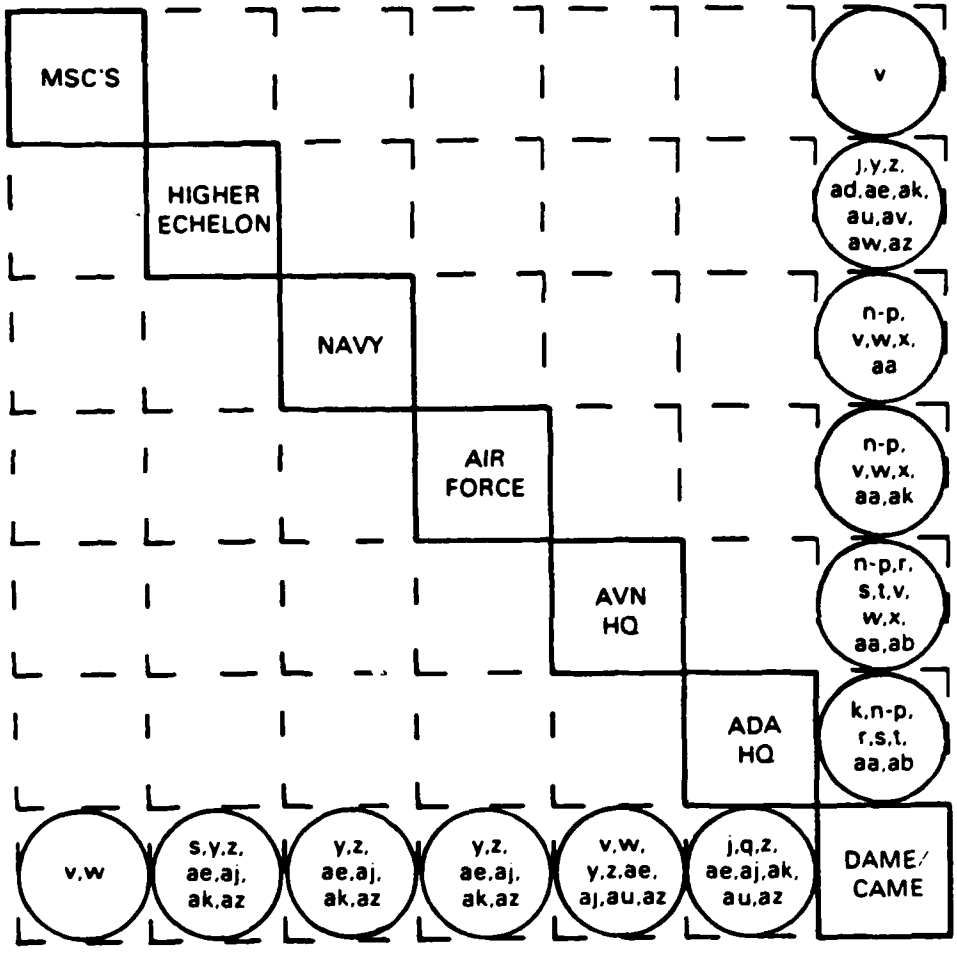


Figure 37. Airspace management element, main CP - external information interface.

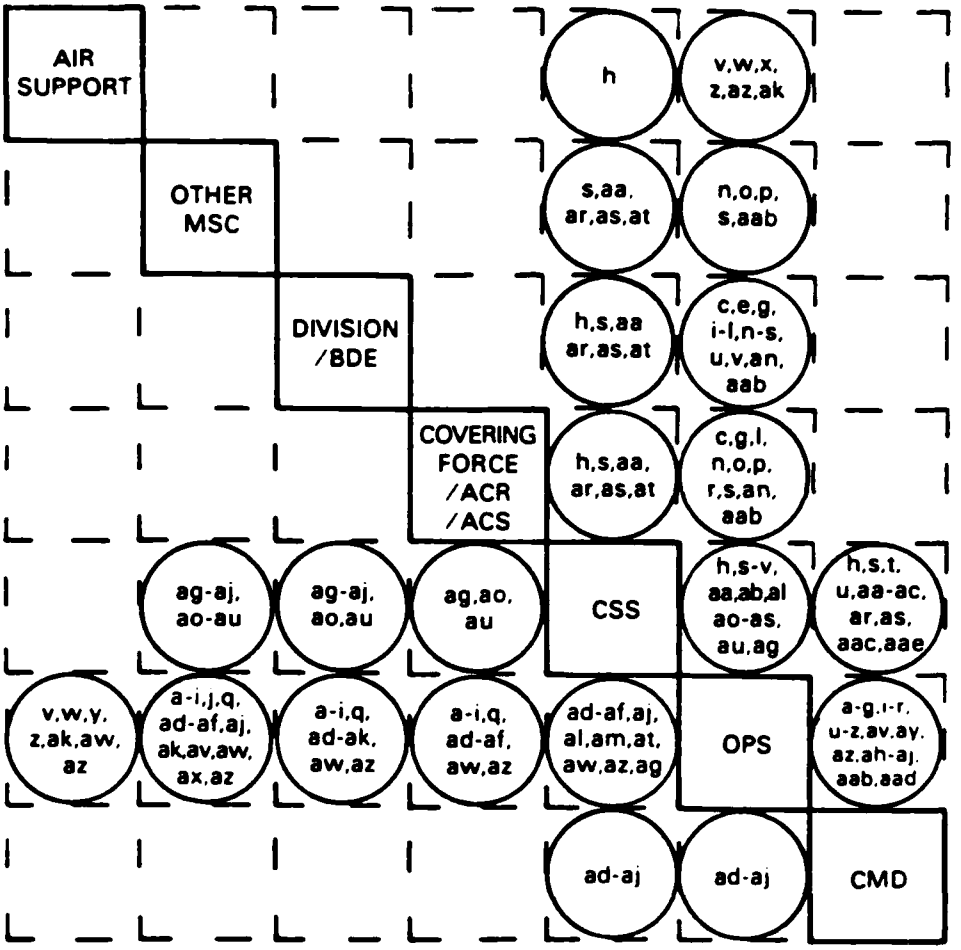
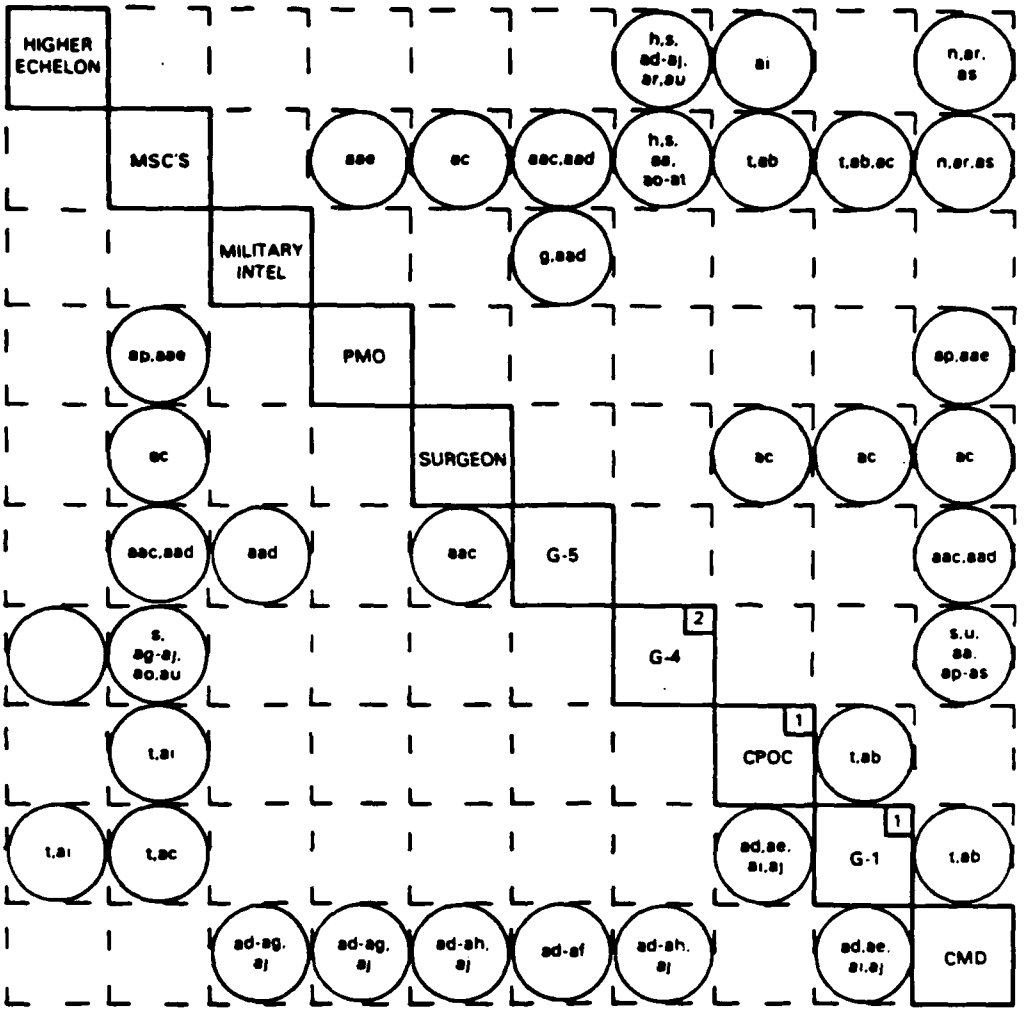


Figure 38. TAC CP - information interface.



NOTES: 1. DIVISION G-1 PRIMARY OPERATION AT MAIN, MAY NOT OPERATE A DISTINCT PERSONNEL OPERATION CENTER (POC).
2. CORPS G-4 PRIMARY OPERATION AT MAIN.

Figure 39. Division support area/rear CP - information flow.

Table 16. Information item exchange.

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
CMD	OPS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT
	LOG	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AJ	PRIORITY SUPPORT TO CMBT
	ASIC	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
	FSE	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
	ADMN	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT
	ENGR	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
	CE	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AG	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
OPS	CMD	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	I	PROBABLE ENEMY C OF A	J	ADA PRIORITIES
		K	ADA STAT/COVERAGE	L	ARTY STATUS	M	FORCE RATIOS
		N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		Q	TASK ORG FOR COMBAT	R	COMM STATUS	U	RESERVE/UNCOM FORCE STAT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AV	ADJ/FRIEND SIT/ACT
		AY	SPECIAL OPS	AZ	STRIKE WARNINGS	AAB	NBC REPORTS
		AAD	PSYOP STATUS				
	LOG	N	CRITICAL/SERIOUS INCIDENTS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AH	PRIORITY OF RESUPPLY	AJ	PRIORITY SUPPORT TO CMBT
		AL	MINEFIELDS/OBS/BARRIERS	AM	ENGR SPT RQMTS	AT	AMMO RSR
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
	ASIC	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES
		I	PROBABLE ENEMY C OF A	W	A/C ALLOC/PRIORITIES	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AX	EW TASKING	AY	SPECIAL OPS
		AZ	STRIKE WARNINGS	AAB	NBC REPORTS		
	FSE	Q	TASK ORG FOR COMBAT	Z	ENEMY ADA SUPPRESS RQMTS	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AK	PLANNED TGTS & PRIORITIES
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
	ADMN	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
OPS	ADMN	AI	PERSONNEL REPLACE PRIORITIES	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	ENGR	Q	TASK ORG FOR COMBAT	AD	OP/FRAG (WD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT	AM	ENGR SPT RQMTS
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	CE	D	UNIT LOCATIONS/STATUS	R	COMM STATUS	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
	C/MD	N	CRITICAL/SERIOUS INCIDENTS	AD	OP/FRAG (WD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AJ	PRIORITY SUPPORT TO CMBT	AV	ADJ/FRIEND SIT/ACT
		AY	SPECIAL OPS	AZ	STRIKE WARNINGS		
	TACP	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		Z	ENEMY ADA SUPPRESS RQMTS				
	DAME	Q	SIG ENEMY ACTIVITIES	J	ADA PRIORITIES	V	A/C RQMTS/PROJECTIONS
		W	A/C ALLOC/PRIORITIES	AD	OP/FRAG (WD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AV	ADJ/FRIEND SIT/ACT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	BDE	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		J	ADA PRIORITIES	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS	AAB	NBC REPORTS
	SPT	Q	SIG ENEMY ACTIVITIES	AD	OP/FRAG (WD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS	AAB	NBC REPORTS		
	CF	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AD	OP/FRAG (WD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	CEWI	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES	I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT	AX	EW TASKING	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	NBC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USAGE (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
OPS	NBC	D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AK	PLANNED TGTS & PRIORITIES	AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS	AAB	NBC REPORTS		
	MP	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	FAHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	ADHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	AVHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	ENHQ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	SIG	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	F	ENEMY NUCLEAR	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/GS EEI	AJ	PRIORITY SUPPORT TO CMBT
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAB	NBC REPORTS				
	HQHR	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
		AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
	USAF	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
OPS	USAF	Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	ADJ	G	SIG ENEMY ACTIVITIES	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	RSRV	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	I	PROBABLE ENEMY C OF A	Q	TASK ORG FOR COMBAT
		AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/92 EEI
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
LOG	CMD	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		U	RESERVE/UNCOM FORCE STAT	AA	EQUIP LOSSES	AC	MEDICAL STATUS
		AQ	CMD CNTRLD/CRIT ITEMS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AAC	CMD OPS/SIT	AAE	PW/CIV DETAINEE STATUS		
	OPS	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		U	RESERVE/UNCOM FORCE STAT	V	A/C RQMTS/PROJECTIONS	AA	EQUIP LOSSES
		AB	PERSONNEL LOSSES	AQ	CMD CNTRLD/CRIT ITEMS	AL	MINEFIELDS/OBS/BARRIERS
		AO	SUPPLY POINT LOC/CAP	AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AU	AMMO CSR
	FSE	AQ	CMD CNTRLD/CRIT ITEMS	AS	MAINT STATUS	AU	AMMO CSR
	ADMN	T	CRITICAL PERSONNEL (MOS)	AQ	CMD CNTRLD/CRIT ITEMS		
	ENGR	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AM	ENGR SPT RQMTS
	CE	AQ	CMD CNTRLD/CRIT ITEMS				
	C/MD	AQ	CMD CNTRLD/CRIT ITEMS				
	DAME	AQ	CMD CNTRLD/CRIT ITEMS	AU	AMMO CSR		
	BDE	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP	AQ	MOVEMENT RQST/ROUTING
		AU	AMMO CSR				
	SPT	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AU	AMMO CSR		
	CF	AQ	CMD CNTRLD/CRIT ITEMS	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
	CEWI	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	NBC	H	STATUS TRANS FACILITIES	AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USAIC (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION	ITEM CODE	ITEM DESCRIPTION
LOG	NBC	AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	MP	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	FAHQ	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	ADHQ	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	AVHQ	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	ENHQ	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	SIG	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AQ	MOVEMENT RQST/ROUTING				
	HGHR	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AT	AMMO RSR		
	USAF	V	A/C RQMTS/PROJECTIONS				
	RSRV	H	STATUS TRANS FACILITIES	AG	CMD CNTRLD/CRIT ITEMS		
ASIC	OPS	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		M	FORCE RATIOS	S	ASSETS (MATERIEL) AVAIL	V	A/C RQMTS/PROJECTIONS
		W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN	AA	EQUIP LOSSES
	LOG	H	STATUS TRANS FACILITIES	AA	EQUIP LOSSES		
	ADMN	T	CRITICAL PERSONNEL (MOS)				
	HGHR	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		AF	COMMAND/G2 EEI				
	ADJ	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES				

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE DESCRIPTION	ITEM CODE DESCRIPTION	ITEM CODE DESCRIPTION
ASIC	COMI	AX EW TASKING		
	EEI	AX EW TASKING		
	IMAG	AX EW TASKING		
	MTI	AX EW TASKING		
	RUMI	AX EW TASKING		
	LWR	A TERRAIN D ENEMY 2ND ECHELON G SIG ENEMY ACTIVITIES AF COMMAND/G2 EEI	B WEATHER E ENEMY CONC TO 300KM H STATUS TRANS FACILITIES	C ENEMY 1ST ECHELON F ENEMY NUCLEAR I PROBABLE ENEMY C OF A
FSE	OPS	L ARTY STATUS S ASSETS (MATERIEL) AVAIL AZ STRIKE WARNINGS	O UNIT LOCATIONS/STATUS AJ PRIORITY SUPPORT TO CMBT	R COMM STATUS AK PLANNED TGTS & PRIORITIES
	LOG	AA EQUIP LOSSES AT AMMO RSR	AR SUPPLY STAT BY CLASS	AS MAINT STATUS
	ADMN	T CRITICAL PERSONNEL (MOS)		
	TACP	AZ STRIKE WARNINGS		
	DAME	AK PLANNED TGTS & PRIORITIES	AZ STRIKE WARNINGS	
	FAHQ	Q TASK ORG FOR COMBAT AJ PRIORITY SUPPORT TO CMBT AZ STRIKE WARNINGS	Z ENEMY ADA SUPPRESS RQMTS AK PLANNED TGTS & PRIORITIES	AE BATTLEFIELD CONTROL AU AMMO CSR
	HQHR	S ASSETS (MATERIEL) AVAIL AK PLANNED TGTS & PRIORITIES	AE BATTLEFIELD CONTROL AZ STRIKE WARNINGS	AJ PRIORITY SUPPORT TO CMBT
	NAVY	Z ENEMY ADA SUPPRESS RQMTS AK PLANNED TGTS & PRIORITIES	AE BATTLEFIELD CONTROL AZ STRIKE WARNINGS	AJ PRIORITY SUPPORT TO CMBT
ADMN	OPS	T CRITICAL PERSONNEL (MOS)	U RESERVE/UNCOM FORCE STAT	
	LOG	T CRITICAL PERSONNEL (MOS)	AB PERSONNEL LOSSES	AI PERSONNEL REPLACE PRIORITIES
	HQHR	T CRITICAL PERSONNEL (MOS)		
	P&A	AI PERSONNEL REPLACE PRIORITIES		
	MEDI	AI PERSONNEL REPLACE PRIORITIES		
	JAIL	AAE PW/CIV DETAINEE STATUS		
	MSC	AI PERSONNEL REPLACE PRIORITIES		

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
ENGR	OPS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	AL	MINEFIELDS/OBS/BARRIERS
		AN	ADM MISSIONS				
	LOG	H	STATUS TRANS FACILITIES				
	ADMN	T	CRITICAL PERSONNEL (MOS)				
	ENHQ	H	STATUS TRANS FACILITIES	G	TASK ORG FOR COMBAT	AJ	PRIORITY SUPPORT TO CMBT
		AL	MINEFIELDS/OBS/BARRIERS	AM	ENGR SIT RQMTS	AN	ADM MISSIONS
		AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	HGHR	H	STATUS TRANS FACILITIES	N	CRITICAL/SERIOUS INCIDENTS	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AL	MINEFIELDS/OBS/BARRIERS	AN	ADM MISSIONS
		AW	CRIT SIT ALERT				
CE	OPS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	R	COMM STATUS
	ADMN	T	CRITICAL PERSONNEL (MOS)				
	SIG	N	CRITICAL/SERIOUS INCIDENTS	R	COMM STATUS	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/CE EEI	AQ	CMD CNTRLD/CRIT ITEMS
	HGHR	N	CRITICAL/SERIOUS INCIDENTS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
	MSC	R	COMM STATUS				
C/MD	OPS	Q	SIG ENEMY ACTIVITIES	N	CRITICAL/SERIOUS INCIDENTS	AAC	CMD OPS/SIT
		AAD	PSYOP STATUS				
	LOG	H	STATUS TRANS FACILITIES				
	HGHR	AAC	CMD OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS
	MSC	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	HOST	AAC	CMD OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS
	PSY	AAD	PSYOP STATUS				
	C/A	AAC	CMD OPS/SIT				
TACP	ASIC	A	TERRAIN	E	ENEMY CONC TO 300KM	Q	SIG ENEMY ACTIVITIES
		H	STATUS TRANS FACILITIES				
	FSE	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
TACP	DAME	Z	ENEMY ADA SUPPRESS RQMTS	AZ	STRIKE WARNINGS		
DAME	OPS	K	ADA STAT/COVERAGE	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	S	ASSETS (MATERIEL) AVAIL	V	A/C RQMTS/PROJECTIONS
		W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES	AD	OP/FRAG ORD/PLAN
	LOG	S	ASSETS (MATERIEL) AVAIL	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES
		Y	AIRSPACE RESTRICTIONS	AA	EQUIP LOSSES		
	FSE	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AD	OP/FRAG ORD/PLAN
	TACP	Y	AIRSPACE RESTRICTIONS	AZ	STRIKE WARNINGS		
	ADHQ	J	ADA PRIORITIES	Q	TASK ORG FOR COMBAT	Z	ENEMY ADA SUPPRESS RQMTS
		AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AU	AMMO CSR	AZ	STRIKE WARNINGS		
	AVHQ	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS
		Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT
		AU	AMMO CSR	AZ	STRIKE WARNINGS		
	HQHR	S	ASSETS (MATERIEL) AVAIL	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS
		AE	BATTLEFIELD CONTROL	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES
		AZ	STRIKE WARNINGS				
	USAF	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS
	NAVY	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AE	BATTLEFIELD CONTROL
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS
	MSC	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES		
INFO	CMD	N	CRITICAL/SERIOUS INCIDENTS				
SWO	CMD	B	WEATHER				
	OPS	B	WEATHER				
	LOG	B	WEATHER				
	ASIC	B	WEATHER				
	FSE	B	WEATHER				
	ENGR	B	WEATHER				

Table 16. Information item exchange (continued).

N SQUARE REPORT BY ORIGIN (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
SWO	CE	B	WEATHER				
	TACP	B	WEATHER				
	DANE	B	WEATHER				
TCSS	TOPS	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		U	RESERVE/UNCOM FORCE STAT	V	A/C RQMTS/PROJECTIONS	AA	EQUIP LOSSES
		AB	PERSONNEL LOSSES	AQ	CMD CNTRLD/CRIT ITEMS	AL	MINEFIELDS/OBS/BARRIERS
		AO	SUPPLY POINT LOC/CAP	AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AU	AMMO CSR
	TCMD	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		U	RESERVE/UNCOM FORCE STAT	AA	EQUIP LOSSES	AB	PERSONNEL LOSSES
		AC	MEDICAL STATUS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AAC	CMD OPS/SIT	AAE	PW/CIV RETAINEE STATUS		
	BDE	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
	CF	AG	CMD CNTRLD/CRIT ITEMS	AO	SUPPLY POINT LOC/CAP	AU	AMMO CSR
TOPS	TCSS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/Q2 EEI
		AH	PRIORITY OF RESUPPLY	AJ	PRIORITY SUPPORT TO CMBT	AL	MINEFIELDS/OBS/BARRIERS
		AM	ENGR SPT RQMTS	AT	AMMO RSR	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	TCMD	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	I	PROBABLE ENEMY C OF A	J	ADA PRIORITIES
		K	ADA STAT/COVERAGE	L	ARTY STATUS	M	FORCE RATIOS
		N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		Q	TASK ORG FOR COMBAT	R	COMM STATUS	U	RESERVE/UNCOM FORCE STAT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AV	ADJ/FRIEND SIT/ACT
		AY	SPECIAL OPS	AZ	STRIKE WARNINGS	AAB	NBC REPORTS
		AAD	PSYOP STATUS				
	BDE	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AD	OP/FRAG (ORD)/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/Q2 EEI	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	CF	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
TOPS	CF	G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		Q	TASK ORG FOR COMBAT	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	AIR	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	Y	AIRSPACE RESTRICTIONS
		Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
TCMD	TCSS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT				
	TOPS	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT				
MI	R-G5	G	SIG ENEMY ACTIVITIES	AAD	PSYOP STATUS		
R-G5	MI	AAD	PSYOP STATUS				
	RCMD	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	SURG	AAC	CMD OPS/SIT				
	MSC	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
PMO	RCMD	AP	TRANS STATUS	AAE	PW/CIV DETAINEE STATUS		
	MSC	AP	TRANS STATUS	AAE	PW/CIV DETAINEE STATUS		
RCMD	MI	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
	R-G5	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
	PMO	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AJ	PRIORITY SUPPORT TO CMBT		
	SURG	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AJ	PRIORITY SUPPORT TO CMBT
	R-G1	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT				
	R-G4	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AF	COMMAND/G2 EEI
		AQ	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY	AJ	PRIORITY SUPPORT TO CMBT

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
SURG	RCMD	AC	MEDICAL STATUS				
	CPOC	AC	MEDICAL STATUS				
	R-G1	AC	MEDICAL STATUS				
	MSC	AC	MEDICAL STATUS				
CPOC	R-G1	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES		
	MSC	T	CRITICAL PERSONNEL (MOS)	AI	PERSONNEL REPLACE PRIORITIES		
R-G1	RCMD	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES		
	CPOC	AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AI	PERSONNEL REPLACE PRIORITIES
		AJ	PRIORITY SUPPORT TO CMBT				
	HQHR	T	CRITICAL PERSONNEL (MOS)	AI	PERSONNEL REPLACE PRIORITIES		
	MSC	T	CRITICAL PERSONNEL (MOS)	AC	MEDICAL STATUS		
R-G4	RCMD	S	ASSETS (MATERIEL) AVAIL	U	RESERVE/UNCOM FORCE STAT	AA	EQUIP LOSSES
		AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS				
	HQHR	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS	AT	AMMO RSR		
	MSC	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTRLD/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AO	SUPPLY POINT LOC/CAP
		AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS	AT	AMMO RSR	AU	AMMO CSR
BDE	OPS	C	ENEMY 1ST ECHELON	E	ENEMY CONC TO 300KM	Q	SIG ENEMY ACTIVITIES
		I	PROBABLE ENEMY C OF A	J	ADA PRIORITIES	K	ADA STAT/COVERAGE
		L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	Q	TASK ORG FOR COMBAT	R	COMM STATUS
		S	ASSETS (MATERIEL) AVAIL	U	RESERVE/UNCOM FORCE STAT	V	A/C RQMTS/PROJECTIONS
		AN	ADM MISSIONS	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AT	AMMO RSR	AU	AMMO CSR		
	TCSS	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	ITEM DESCRIPTION
BDE TOPS		C	ENEMY 1ST ECHELON
		I	PROBABLE ENEMY C OF A
		L	ARTY STATUS
		P	UNIT ACT/CMDRS ASSESSMENT
		S	ASSETS (MATERIEL) AVAIL
		AN	ADM MISSIONS
		E	ENEMY CONC TO 300KM
		J	ADA PRIORITIES
		N	CRITICAL/SERIOUS INCIDENTS
		Q	TASK ORG FOR COMBAT
		U	RESERVE/UNCOM FORCE STAT
		AAB	NBC REPORTS
		Q	SIG ENEMY ACTIVITIES
		K	ADA STAT/COVERAGE
		O	UNIT LOCATIONS/STATUS
		R	COMM STATUS
		V	A/C RQMTS/PROJECTIONS
SPT OPS		Q	SIG ENEMY ACTIVITIES
		Q	TASK ORG FOR COMBAT
		AAA	RADIATION DOSE STATUS
		N	CRITICAL/SERIOUS INCIDENTS
		R	COMM STATUS
		AAB	NBC REPORTS
		O	UNIT LOCATIONS/STATUS
		U	RESERVE/UNCOM FORCE STAT
LOG		H	STATUS TRANS FACILITIES
		AO	SUPPLY POINT LOC/CAP
		AS	MAINT STATUS
		S	ASSETS (MATERIEL) AVAIL
		AP	TRANS STATUS
		U	RESERVE/UNCOM FORCE STAT
		AR	SUPPLY STAT BY CLASS
CF OPS		C	ENEMY 1ST ECHELON
		N	CRITICAL/SERIOUS INCIDENTS
		R	COMM STATUS
		AAA	RADIATION DOSE STATUS
		Q	SIG ENEMY ACTIVITIES
		O	UNIT LOCATIONS/STATUS
		S	ASSETS (MATERIEL) AVAIL
		AAB	NBC REPORTS
		L	ARTY STATUS
		P	UNIT ACT/CMDRS ASSESSMENT
		AN	ADM MISSIONS
LOG		H	STATUS TRANS FACILITIES
		AR	SUPPLY STAT BY CLASS
		S	ASSETS (MATERIEL) AVAIL
		AS	MAINT STATUS
		AA	EQUIP LOSSES
		AT	AMMO RSR
TCSS		H	STATUS TRANS FACILITIES
		AR	SUPPLY STAT BY CLASS
		S	ASSETS (MATERIEL) AVAIL
		AS	MAINT STATUS
		AA	EQUIP LOSSES
		AT	AMMO RSR
TOPS		C	ENEMY 1ST ECHELON
		N	CRITICAL/SERIOUS INCIDENTS
		R	COMM STATUS
		AAB	NBC REPORTS
		Q	SIG ENEMY ACTIVITIES
		O	UNIT LOCATIONS/STATUS
		S	ASSETS (MATERIEL) AVAIL
		L	ARTY STATUS
		P	UNIT ACT/CMDRS ASSESSMENT
		AN	ADM MISSIONS
CEWI OPS		Q	SIG ENEMY ACTIVITIES
		P	UNIT ACT/CMDRS ASSESSMENT
		AAB	NBC REPORTS
		N	CRITICAL/SERIOUS INCIDENTS
		S	ASSETS (MATERIEL) AVAIL
		O	UNIT LOCATIONS/STATUS
		AAA	RADIATION DOSE STATUS
LOG		S	ASSETS (MATERIEL) AVAIL
		AR	SUPPLY STAT BY CLASS
		AA	EQUIP LOSSES
		AS	MAINT STATUS
		AQ	MOVEMENT RQST/ROUTING
		AT	AMMO RSR
NBC OPS		N	CRITICAL/SERIOUS INCIDENTS
		S	ASSETS (MATERIEL) AVAIL
		O	UNIT LOCATIONS/STATUS
		AAA	RADIATION DOSE STATUS
		P	UNIT ACT/CMDRS ASSESSMENT
		AAB	NBC REPORTS
LOG		S	ASSETS (MATERIEL) AVAIL
		AR	SUPPLY STAT BY CLASS
		AA	EQUIP LOSSES
		AS	MAINT STATUS
		AQ	MOVEMENT RQST/ROUTING
		AT	AMMO RSR
MP OPS		N	CRITICAL/SERIOUS INCIDENTS
		O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USING (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
MP	OPS	S	ASSETS (MATERIEL) AVAIL	AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS
	LOG	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AQ	MOVEMENT RQST/ROUTING	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
		AT	AMMO RSR	AAE	PW/CIV DETAINEE STATUS		
FAHQ	FSE	L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL
		T	CRITICAL PERSONNEL (MOS)	AA	EQUIP LOSSES	AB	PERSONNEL LOSSES
ADHQ	DAME	K	ADA STAT/COVERAGE	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL
		T	CRITICAL PERSONNEL (MOS)	AA	EQUIP LOSSES	AB	PERSONNEL LOSSES
AVHQ	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES		
ENHQ	ENGR	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES	AL	MINEFIELDS/OBS/BARRIERS
		AN	ADM MISSIONS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
SIG	CE	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		R	COMM STATUS	S	ASSETS (MATERIEL) AVAIL	T	CRITICAL PERSONNEL (MOS)
		AA	EQUIP LOSSES	AB	PERSONNEL LOSSES	AR	SUPPLY STAT BY CLASS
		AS	MAINT STATUS				
HCHR	OPS	N	CRITICAL/SERIOUS INCIDENTS	AD	OP/FRAG (WRD/PLAN	AE	BATTLEFIELD CONTROL
		AF	COMMAND/G2 EEI	AG	CMD CNTRL D/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AK	PLANNED TQTS & PRIORITIES
		AV	ADJ/FRIEND SIT/ACT	AZ	STRIKE WARNINGS		
	LOG	S	ASSETS (MATERIEL) AVAIL	AG	CMD CNTRL D/CRIT ITEMS	AH	PRIORITY OF RESUPPLY
		AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT	AR	SUPPLY STAT BY CLASS
		AU	AMMO CSR				
	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES	I	PROBABLE ENEMY C OF A
		AF	COMMAND/G2 EEI				
	FSE	Z	ENEMY ADA SUPPRESS RQMTS	AD	OP/FRAG (WRD/PLAN	AE	BATTLEFIELD CONTROL

Table 16. Information item exchange (continued).

N SQUAD REPORT BY UNITS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
HCHR	FSE	AK	PLANNED TGTS & PRIORITIES	AU	AMMO CSR	AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS		
	ADMN	AI	PERSONNEL REPLACE PRIORITIES				
	ENGR	H	STATUS TRANS FACILITIES	N	CRITICAL/SERIOUS INCIDENTS	AL	MINEFIELDS/OBS/BARRIERS
		AN	ADM MISSIONS	AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS
	CE	N	CRITICAL/SERIOUS INCIDENTS				
	C/MO	AAC	CMO OPS/SIT	AAD	PSYOP STATUS		
	DAME	J	ADA PRIORITIES	Y	AIRSPACE RESTRICTIONS	Z	ENEMY ADA SUPPRESS RQMTS
		AD	OP/FRAG ORD/PLAN	AE	BATTLEFIELD CONTROL	AK	PLANNED TGTS & PRIORITIES
		AU	AMMO CSR	AV	ADJ/FRIEND SIT/ACT	AW	CRIT SIT ALERT
		AZ	STRIKE WARNINGS				
	RCMD	N	CRITICAL/SERIOUS INCIDENTS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
	CPOC	AI	PERSONNEL REPLACE PRIORITIES				
	R-G4	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AD	OP/FRAG ORD/PLAN
		AE	BATTLEFIELD CONTROL	AF	COMMAND/SP REI	AQ	CMD CNTRLD/CRIT ITEMS
		AH	PRIORITY OF RESUPPLY	AI	PERSONNEL REPLACE PRIORITIES	AJ	PRIORITY SUPPORT TO CMBT
		AR	SUPPLY STAT BY CLASS	AU	AMMO CSR		
USAF	OPS	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AZ	STRIKE WARNINGS				
	LOG	H	STATUS TRANS FACILITIES				
	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES	AK	PLANNED TGTS & PRIORITIES		
ADJ	OPS	Q	SIG ENEMY ACTIVITIES	N	CRITICAL/SERIOUS INCIDENTS	AV	ADJ/FRIEND SIT/ACT
		AW	CRIT SIT ALERT	AZ	STRIKE WARNINGS	AAB	NBC REPORTS
	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		Q	SIG ENEMY ACTIVITIES				
RSRV	OPS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT	U	RESERVE/UNCOM FORCE STAT
		AAA	RADIATION DOSE STATUS	AAB	NBC REPORTS		
COMI	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
COMI	ASIC	G	SIG ENEMY ACTIVITIES				
ELI	ASIC	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES		
IMAG	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES				
MTI	ASIC	B	WEATHER	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON
		E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES
HUMI	ASIC	A	TERRAIN	B	WEATHER	C	ENEMY 1ST ECHELON
		D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM	F	ENEMY NUCLEAR
		G	SIG ENEMY ACTIVITIES				
LWR	ASIC	C	ENEMY 1ST ECHELON	D	ENEMY 2ND ECHELON	E	ENEMY CONC TO 300KM
		F	ENEMY NUCLEAR	G	SIG ENEMY ACTIVITIES	H	STATUS TRANS FACILITIES
		I	PROBABLE ENEMY C OF A	R	COMM STATUS	AF	COMMAND/Q2 EEI
NAVY	FSE	L	ARTY STATUS	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS
		P	UNIT ACT/CMDRS ASSESSMENT	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
	DAME	N	CRITICAL/SERIOUS INCIDENTS	O	UNIT LOCATIONS/STATUS	P	UNIT ACT/CMDRS ASSESSMENT
		V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		AA	EQUIP LOSSES				
P&A	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES		
MEDI	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES	AC	MEDICAL STATUS
JAIL	ADMN	O	UNIT LOCATIONS/STATUS	AB	PERSONNEL LOSSES	AAE	PW/CIV DETAINEE STATUS
MSC	ADMN	O	UNIT LOCATIONS/STATUS	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES
	CE	O	UNIT LOCATIONS/STATUS	R	COMM STATUS		
	C/MO	AAC	CMO OPS/SIT	AAD	PSYOP STATUS	AAE	PW/CIV DETAINEE STATUS

Table 16. Information item exchange (continued).

N SQUARE REPORT BY USERS (FROM)

FROM	TO	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION	ITEM CODE	DESCRIPTION
MSC	DAME	V	A/C RQMTS/PROJECTIONS				
	R-G5	AAC	CMD OPS/SIT	AAD	PSYOP STATUS		
	PMO	AAE	PW/CIV DETAINEE STATUS				
	RCMD	N	CRITICAL/SERIOUS INCIDENTS	AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS
	SURG	AC	MEDICAL STATUS				
	CPOC	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES		
	R-G1	T	CRITICAL PERSONNEL (MOS)	AB	PERSONNEL LOSSES	AC	MEDICAL STATUS
	R-G4	H	STATUS TRANS FACILITIES	S	ASSETS (MATERIEL) AVAIL	AA	EQUIP LOSSES
		AO	SUPPLY POINT LOC/CAP	AP	TRANS STATUS	AQ	MOVEMENT RQST/ROUTING
		AR	SUPPLY STAT BY CLASS	AS	MAINT STATUS	AT	AMMO RSR
HOST	C/MD	H	STATUS TRANS FACILITIES	AAC	CMD OPS/SIT	AAD	PSYOP STATUS
PSY	C/MD	AAD	PSYOP STATUS				
C/A	C/MD	AAC	CMD OPS/SIT				
AIR	TCSS	H	STATUS TRANS FACILITIES				
	TOPS	V	A/C RQMTS/PROJECTIONS	W	A/C ALLOC/PRIORITIES	X	A/C SORTIES EXPEND/REMAIN
		Z	ENEMY ADA SUPPRESS RQMTS	AK	PLANNED TGTS & PRIORITIES	AZ	STRIKE WARNINGS

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